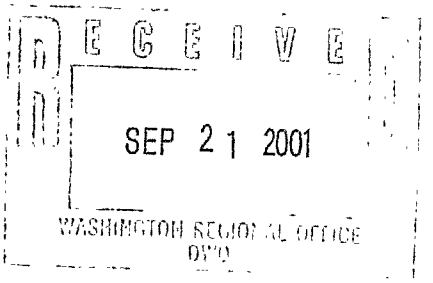
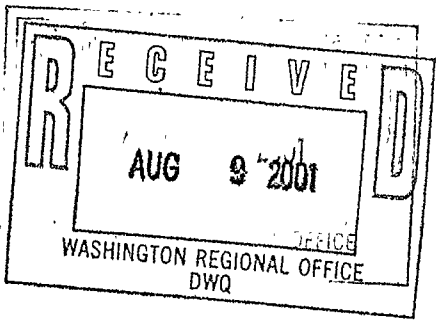
174IHSSF242

DocumentID	NONCD0002818
Site Name	DUPONT-KENTEC
DocumentType	Other (O)
RptSegment	1
DocDate	6/28/2001
DocRcvd	2/20/2007
Box	SF242
AccessLevel	Public
Division	Waste Management
Section	Superfund
Program	IHS (IHS)
DocCat	Facility

Non-Discharge Permit Application

DuPont Kentec, Kinston NC





June 28, 2001

Prepared by:

CORPORATE REMEDIATION GROUP
An Alliance between
DuPont and URS Diamond
6324 Fairview Road
Charlotte, North Carolina 28210

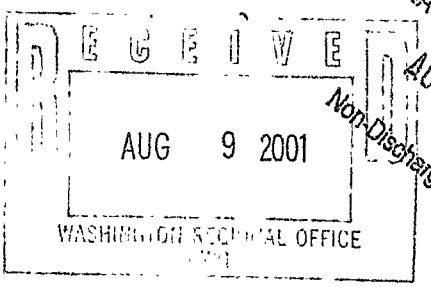
COPY 1

DuPont Engineering
6324 Fairview Road
Charlotte, NC
Tel. (704) 362-6630
Fax. (704) 362-6636

-214

DuPont Engineering

North Carolina Division of Water Quality
Water Quality Section
Non-Discharge Permitting Unit
Post Office Box 29535
Raleigh, North Carolina 27626-0535
(919) 733-5083
(919) 733-0719



Dear Sir or Madame,

The E.I. DuPont de Nemours & Co., Inc. is submitting this application for a Non-Discharge permit pursuant to its Kentec Facility in Kinston, NC. The Kentec Groundwater Interceptor System has been operating for approximately ten years and has reduced contaminant concentration by two orders of magnitude at the site. The approval of this permit will give DuPont the opportunity to install a system which will further expedite the cleanup of this site to Corrective Action Plan required levels.

Currently, the system operates under Pump and Haul Permit Number WQ0005906. This limits the system in its ability to operate at a constant rate due to rail car availability. Extensive computer modeling has indicated that the installation of an infiltration gallery to accept treated groundwater will improve cleanup time, while not affecting the system's ability to capture the groundwater at the site. Our modeling estimates that without these proposed changes this system could operate until 2025, but could achieve CAP required limits, with the recharge of the surficial aquifer, in approximately 10 years.

Our treatment system has been effectively removing organic contaminants and Iron for ten years, and data from the past 2 years indicates to a 99.9% confidence level that effluent is within 2L standards. DuPont intends to utilize this clean effluent to drive remaining contamination into the trench system.

Please also review the attached CD-ROM. You will find an AVI format video showing the contamination cleanup after the installation of the infiltration galleries. We have utilized some of the best 3-D modeling packages available to illustrate the positive impact recharge of the surficial aquifer will have on our system. Also included is the entire Mod-Flow 3D model if you desire to investigate it further.

Thank you for your consideration of our application.

Sincerely,

Andrew F. Alcazar
Environmental Engineer
Corporate Remediation Group – E.I. DuPont de Nemours & Co., Inc.
6210 Fairview Road Charlotte NC 28210
(704) 362-6634 Andrew.F.Alcazar@usa.dupont.com

System Description

System Description

The Kentec Groundwater Infiltration System was constructed in 1991 by CH2M Hill for the DuPont company. The system has operated continuously for 10 years. A full description can be found in the Kentec Corrective Action Plan attached to this document. The following is a brief description.

The system has >5000 linear feet of interceptor trench. A diagram of the trench is included in this packet labeled: Figure ES-5. The trench is lined with slotted drain tile and filled with graded gravel. These trenches encompass the site in the shape of a north facing e. (see map in Section e.).

The interceptor trenches feed to two sumps (Pump Station 1 and Pump Station 2) which use variable speed pumps to send the groundwater to the treatment system. The pumps alternate on and off pumping water from only one sump at a time.

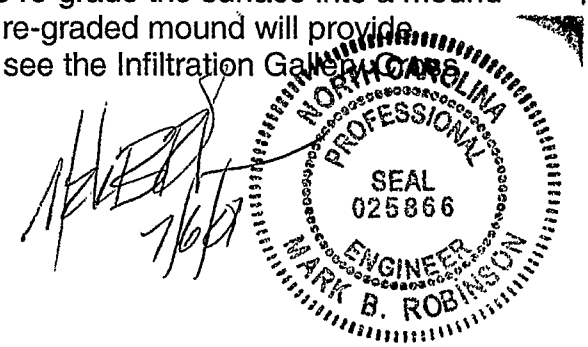
Solids and iron precipitate are removed by a sand filter and a fiber pre-filter prior to being collected by a surge tank. The surge tank equalizes the flow to the treatment system and controls the pumps by a high and low level interlock. Groundwater is then pumped via a transfer pump through a final polishing fiber filter.

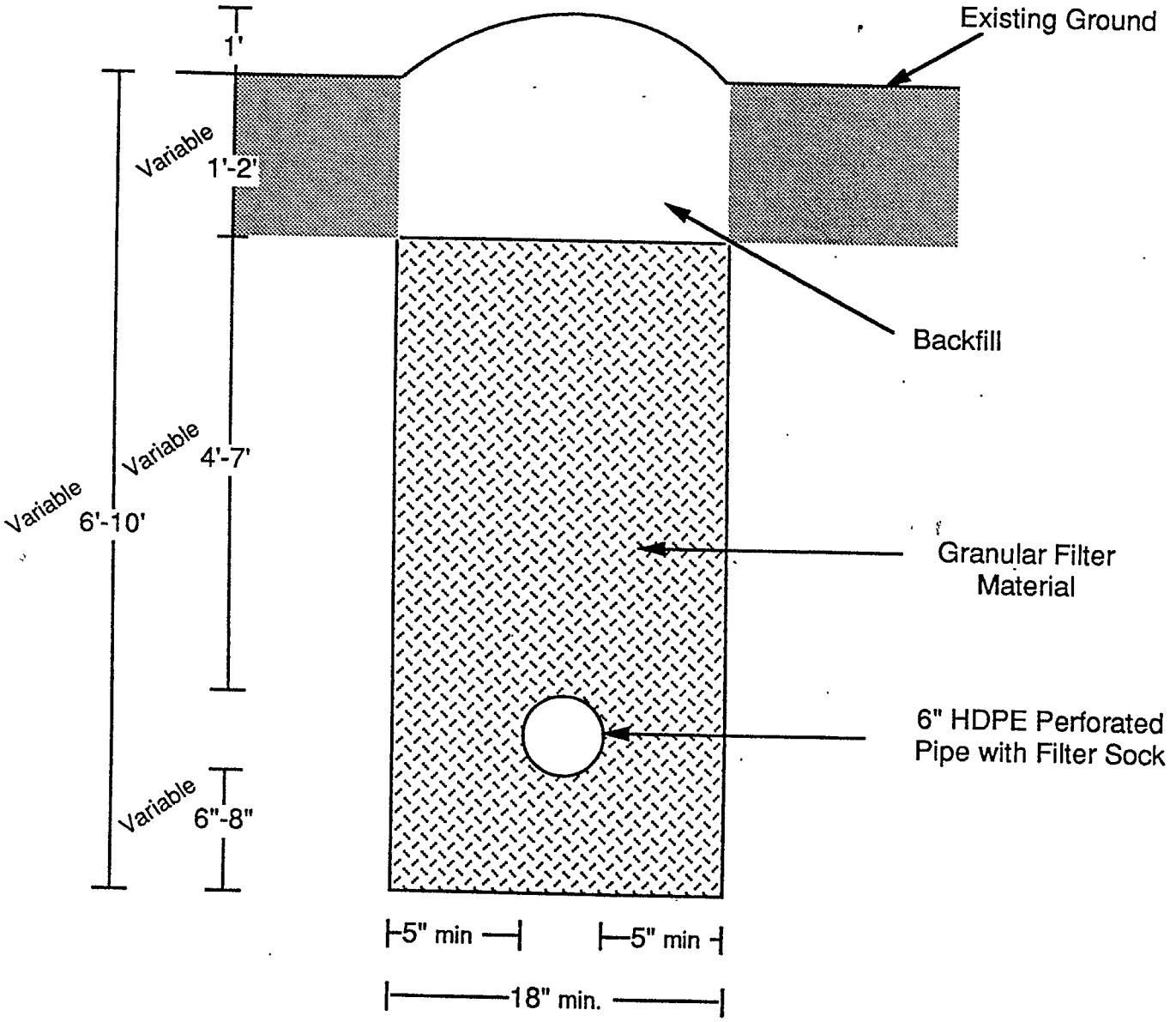
After polishing the groundwater passes into the Ultrox system (see figure ES-6). The Ultrox oxidizes groundwater contaminants with ozone in the presence of high intensity UV lamps. Groundwater is then collected in the effluent tank for transfer to the Carbon Units. The carbon units are the final treatment step.

At this point the old system gravity fed treated groundwater to a holdup tank containing a transfer pump. The water was then transferred to another holdup tank for final transfer to the railcar. It is our proposal that water be transferred by gravity directly after the carbon units to the infiltration gallery.

The outlet from the carbon units provides approximately 4 feet of head to the effluent to be transferred to the infiltration gallery. A transfer line will be installed connecting the existing system to the new infiltration gallery.

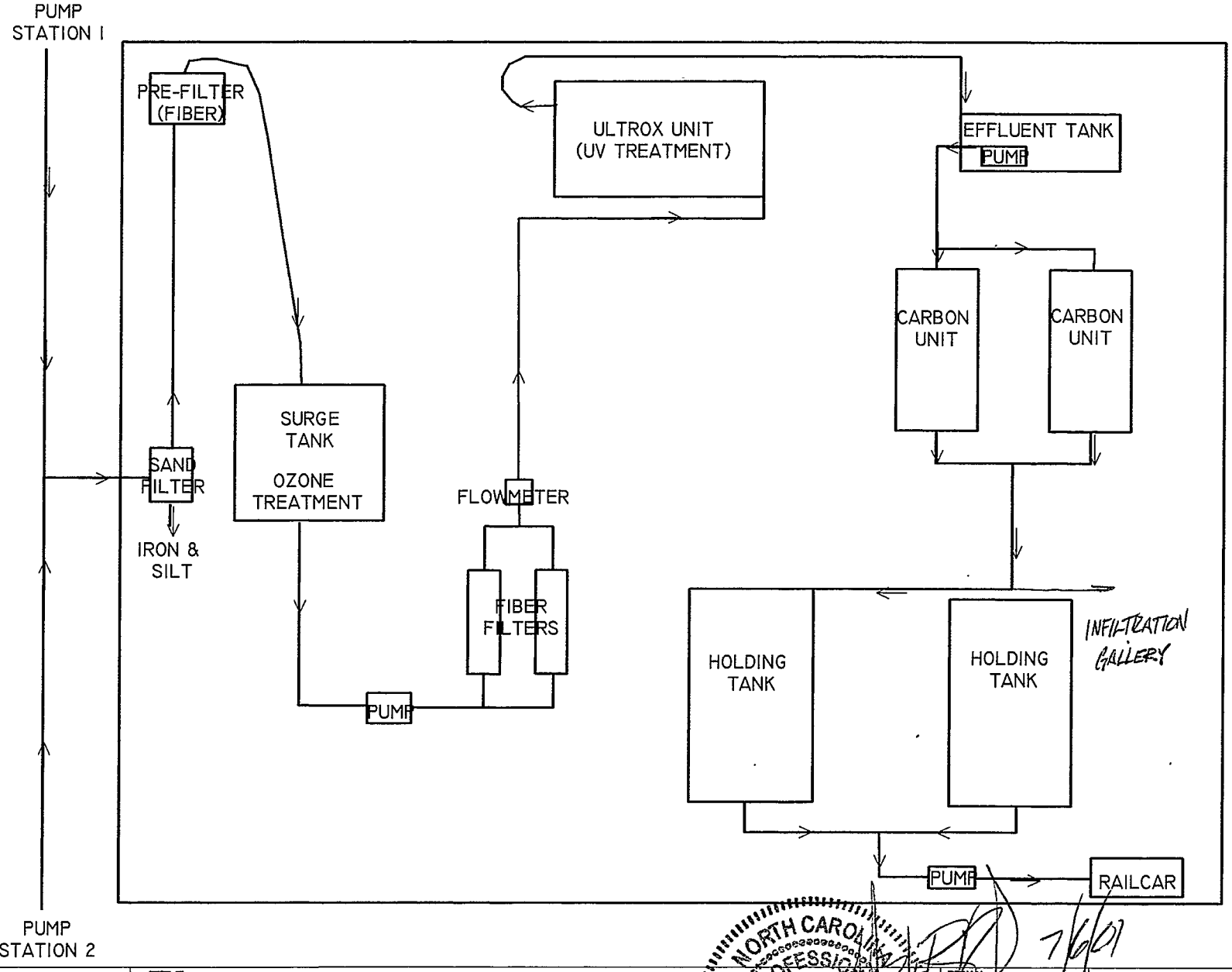
Gravity fed water will be split into three separate 6" slotted drain tiles. The infiltration gallery will be one foot below the existing ground surface and installed with zero grade. The slots will be installed up to insure even distribution of flow. Graded pea gravel will provide for distribution of the water throughout the 18.5'X250' area. Excavated soil will be used to re-grade the surface into a mound 1.5' high and 20.5' wide over the gallery. This re-graded mound will provide freeze protection and divert rainwater. Please see the Infiltration Gallery Cross Section for a graphic depiction.





NORTH CAROLINA PROFESSIONAL SEAL 025866 ENGINEER MARK B. ROBINSON

Figure ES-5
Typical Cross-Section of Groundwater Interceptor Trench



NORTH CAROLINA PROFESSIONAL SEAL 025866 ENGINEER MARK B. ROBINSON

7/6/01

DUPONT

CORPORATE REMEDIATION GROUP
An Alliance between
DuPont and URS Diamond
6324 Fairview Road
Charlotte, NC 28210

TITLE:

SYSTEM DIAGRAM

DRAWN:	APPROVED:	PROJECT NO.:
EMA	AFA	
CHECKED:	DATE:	FIGURE NO:
MH	5/30/01	
FILE NAME:	REVISION:	

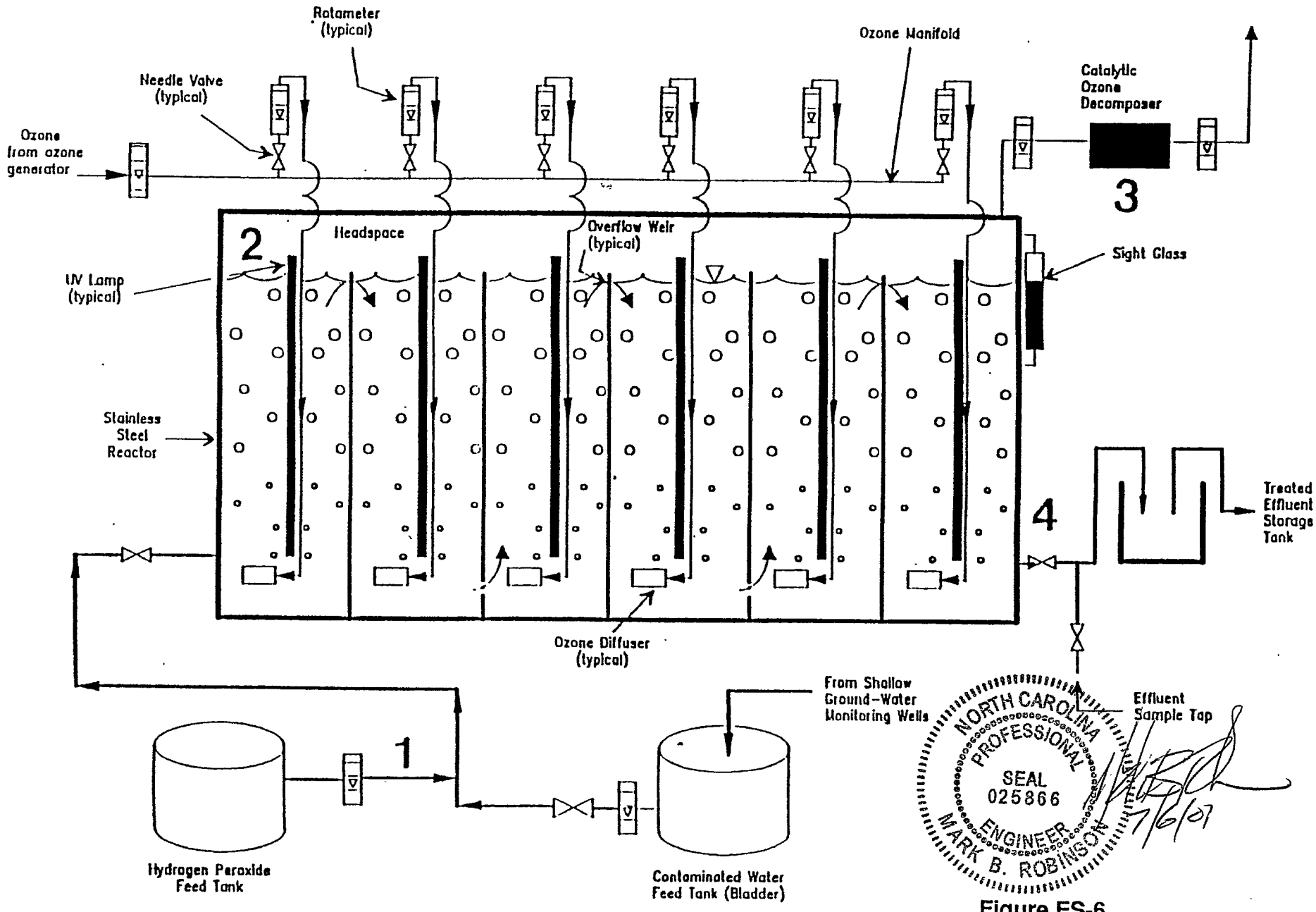
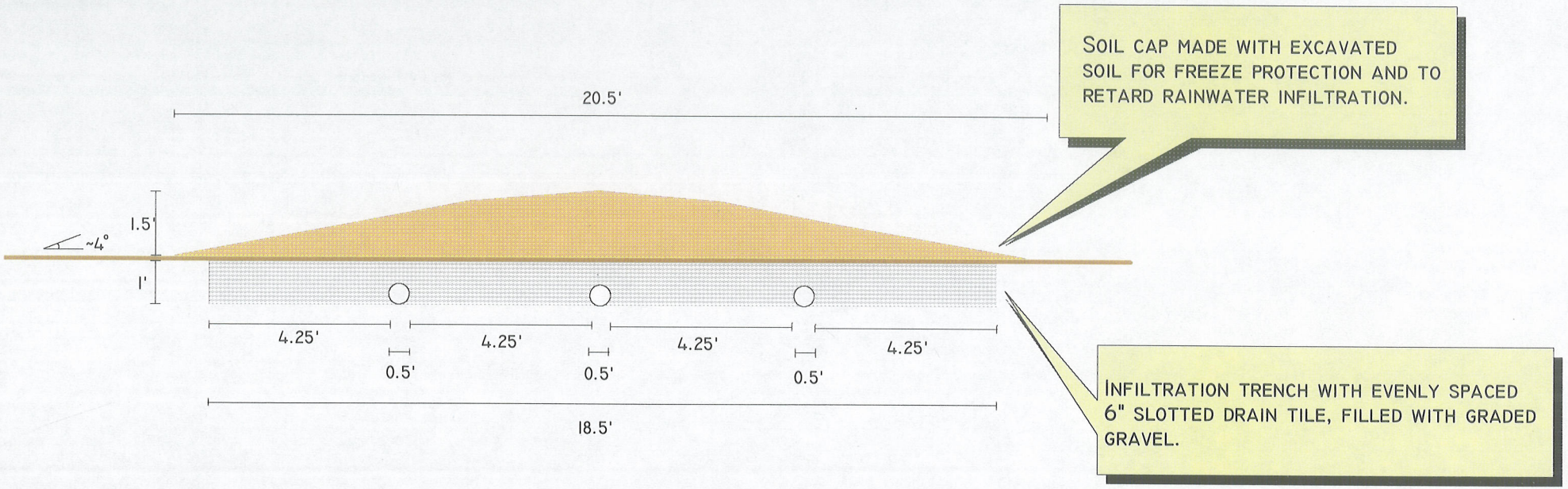


Figure ES-6
Chemical Oxidation System



NORTH CAROLINA PROFESSIONAL SEAL 025866 ENGINEER MARK B. ROBINSON

7/6/01

DUPONT

CORPORATE REMEDIATION GROUP
An Alliance between DuPont and URS Diamond
6324 Fairveiw Road
Charlotte, NC 28210

TITLE:

INFILTRATION GALLERY CROSS SECTION
DUPONT KENTEC FACILITY

DRAWN:	APPROVED:	PROJECT NO.:
EMA	AFA	
CHECKED:	DATE:	FIGURE NO.:
MH	6/27/01	
FILE NAME:	REVISION:	

CHEMICAL OXIDATION TREATABILITY STUDY

Chemical oxidation exploits oxidation-reduction or "redox" reactions in which the oxidation state of at least one reactant is raised while that of another is lowered by electron transfer from one ion to another. Through this process, hazardous constituents can be converted by oxidation to less toxic oxidation states. Some oxidations proceed readily to CO_2 and water. However, the reaction is dependent on oxidant dosage, pH, oxidation potential of the oxidant, and formation of stable

intermediates. Of the many oxidizing agents (oxidants) that exist, peroxide (H_2O_2), ultraviolet (UV) light, and ozone (O_3) were examined in this treatability study.

TREATABILITY STUDY DESIGN

CH2M HILL contracted Ultrox International to perform bench-scale chemical oxidation treatability tests using their ultraviolet oxidation systems. Ultraviolet oxidation is an enhanced oxidation process using UV light with O_3 and/or H_2O_2. Ultraviolet light, when combined with O_3 and/or H_2O_2, produces a highly oxidative environment significantly more destructive than that created with O_3 or H_2O_2 by themselves or in combination. UV light improves the reactivity of ozone or H_2O_2 by the following processes:

- Transformation of O_3 or H_2O_2 to highly reactive hydroxyl (OH) radicals
- Excitation of the target organic solute to a higher energy level
- Initial attack of the target organic solute by UV light

The treatability study was comprised of four different treatability test runs. The primary difference between each run was the oxidant, combination of oxidants, or concentration of oxidant(s) used. The oxidants used in each test run are listed below.

- Test Run 1--UV with 800 mg/l of H_2O_2
- Test Run 2--UV with 1,000 mg/l of H_2O_2
- Test Run 3--UV with 120 mg/l of H_2O_2 and 4 mg/l O_3/minute
- Test Run 4--UV with 180 mg/l of H_2O_2 and 6 mg/l O_3/minute

The bench scale treatability tests employed the following equipment and materials:

- A 2.4 liter cylindrical glass batch reactor
- A 40 watt ultraviolet radiation lamp
- Hydrogen peroxide (H_2O_2)
- Ozone and a 2 lb/day model 8341 Matheson Gas Products ozone generator

The reactor was sealed to minimize incidental releases of excess ozone and VOCs. The UV radiation was provided by one low pressure mercury arc lamp inside a quartz sheath placed in the center of the vessel. The 2 liters of groundwater charged into the reactor were stirred by a magnetic stirrer. Hydrogen peroxide was added before the ultraviolet radiation exposure using a source which is 30 percent hydrogen peroxide and 70 percent water. Ozone is generated with the ozone generator from a commercial oxygen source and is introduced as a ratio of oxygen and ozone using a coarse frit gas dispersion tub (sparger) at the bottom of the reactor.

For each test run, the glass reactor was charged with 2 liters of the filtered groundwater sample. The desired volume of 30 percent H_2O_2 solution was added and mixed for five minutes before introducing UV or ozone. A quartz sheath containing one 40 watt low pressure UV lamp was placed in the middle of the reactor and illuminated for the duration of the test run. For tests in which ozone is used (tests 3 and 4) the measured quantity of oxygen-ozone (O_2-O_3) gas mixture was introduced through the sparger at the predetermined O_2-O_3 flow rate. At the beginning of each working period the ozone output of the ozone generator was determined by titrating an acidified (H_2SO_4) potassium iodide (KI) solution with sodium thiosulfate solution to the starch end point. Samples of treated groundwater were collected at 20 minute intervals and analyzed for the target compounds, iron, total organic carbon (TOC), chemical oxygen demand (COD), and pH. The total retention time of each test run was 60 minutes.

SAMPLE COLLECTION

Groundwater samples were collected at Kentec on April 30, 1991. One 5-gallon groundwater sample was collected by Du Pont from MW4A and shipped overnight to the Ultrox facility in Santa Ana, California, in a cooler packed in ice. Ultrox shipped two 40 milliliter (ml) split samples taken from the groundwater samples to CH2M HILL's laboratory in Montgomery, Alabama, on May 7. The samples were contained in 40 ml VOC vials and received by CH2M HILL on May 9, 1991.

ANALYTICAL PROCEDURES

DCE and DCA concentrations were measured by gas liquid chromatography using EPA Method 601. A Perkin-Elmer 8500 Gas Chromatograph equipped with Tekman LSC-2 Liquid Sample Concentrator (purge and trap) and Model 1000 Hall Detector (electrolytic conductivity detector) was used. The following equipment was used for these analyses:

- GLC Column: 25' x 1/8" SS column packed with 20 percent OV-101 plus 0.1 percent 1500 ON
- 100/120 MESH CHROM WHP
- Syringe: 5 ml gas tight
- Volumetric Flasks: 10, 50, 100, 500, and 1,000 ml with ground glass stoppers
- Microsyringe: μg and 100 μl (Hamilton 701-N)
- Standards: Reagent grade chemicals
- Bottle: Glass with teflon lined screw-caps

1,4-Dioxane concentrations were determined using a Perkin-Elmer gas chromatograph with purge and trap and a flame Ionization Detector. Table 3-2 lists the analytical methods employed with the associated detection limits.

Table 3-2
ANALYTICAL METHODS AND DETECTION LIMITS

Compounds	Method	Detection Limit µg/l
1,4 Dioxane	G.C. w/F.I.D. with purge and trap	100
1,1-DCA	EPA 601	3.0
1,1-DCE	EPA 601	3.0
Iron	EPA 600 2361	500

Iron was analyzed in accordance with EPA method EPA-600 2361 and was performed by Core Laboratories in Anaheim, California.

TREATABILITY STUDY RESULTS

Table 3-3 presents the treatability study test results. The analytical data suggests that DCA is the most difficult compound to oxidize of the target compounds. The DCA clean up level of 7 µg/l was not attained in both runs 1 and 2. These runs did not include ozone as an oxidant. The use of ozone in addition to UV/H_2O_2 in test runs 3 and 4 reduced DCA levels well below the clean up level. This was accomplished with significant decreases in the H_2O_2 levels from those used in runs 1 and 2.

All test runs reduced DCE, 1,4-dioxane and iron concentrations below the required clean up levels. DCE and 1,4-dioxane clean up levels were attained after 40 minutes in all test runs. This may have been true with iron, however, no sample was collected and analyzed for iron at the 20 and 40 minute intervals.

The oxidation of the target compounds produces many by-products. Complete oxidation results in the production of carbon dioxide (CO_2). However, a number of intermediate compounds are formed during the oxidation of the target compounds. TOC data can be used as a surrogate parameter indicating the presence of intermediate compounds. It is anticipated that 1,4-dioxane will oxidize to form oxalic, formic, and glyoxylic acids and eventually CO_2. DCE is expected to oxidize quite rapidly to form CO_2. DCA will likely oxidize to acetic acid and oxalic acid. The acetic acid may then oxidize to formic acid. The oxalic acid and formic acid eventually oxidize to form CO_2. Analytical results show a 50 to 60 percent reduction in TOC.

Table 3-3
TREATABILITY TEST RESULTS

Test Run	Retention Time (min)	0_3 mg/l	H_2O_2 mg/l	COD mg/l	TOC mg/l	1,4-Dioxane ug/l	DCA ug/l	DCE ug/l	Total Iron mg/l	Comments
(1) UV/H_2O_2	0'	-	0	188	91	1,115	225	50	5.4	Filtered, pH adjusted to 7
	20'	-	400	-	-	-	116	<15	-	
	40'	-	800	-	-	<100	75	<5	-	
	60'		800	58	46	<100	20	<5	<0.5	
(2) UV/H_2O_2	0'	-	0	188	91	1,115	225	50	5.4	Filtered, pH adjusted to 7
	20'	-	500	-	-	-	116	<15	-	
	40'	-	1,000	-	-	<100	75	<5	-	
	60'	-	1,000	71	44	<100	20	<5	<0.5	
(3) $UV/O_3/H_2O_2$	0'	0	0	188	91	1,115	225	50	5.4	Filtered, pH adjusted to 7
	20'	80	120	-	-	-	50	<15	-	
	40'	160	120	-	-	<100	10	<5	-	
	60'	240	120	54	37	<100	<3	<3	<0.5	
(4) $UV/O_3/H_2O_2$	0'	0	0	188	91	1,115	225	50	5.4	Filtered, pH adjusted to 7
	20'	120	180	-	-	<100	46	<15	-	
	40'	240	180	-	-	<100	8	<5	-	
	60'	360	180	40	37	<100	<3	<3	<0.5	

Note:
" - " = Not analyzed

The remaining 40 to 50 percent of TOC is likely comprised of traces of the target compounds and mostly the intermediate compounds. The intermediate compounds are not regulated hazardous substances. The fact that the TOC is being reduced by 50 to 60 percent indicates that much of the target compounds are oxidizing to CO_2.

Iron removal is accomplished by the precipitation of iron oxide (rust). The iron is oxidized to form iron oxide. The iron oxide is not as soluble as the dissolved iron and subsequently precipitates out of solution.

The initial pH of the groundwater samples was 8.7 before each test run the pH was lowered to seven using concentrated sulfuric acid. This was done to enhance the oxidation process.

CONCLUSIONS

Results of the treatability study indicate that a $UV/O_3/H_2O_2$ treatment system can effectively reduce all of the target compounds to the required clean up levels. The UV/H_2O_2 system alone was unable to reduce DCA in the groundwater sample to the required clean up level. In addition to the treatability test results, the $UV/O_3/H_2O_2$ system offers three important advantages over the UV/H_2O_2 system. These include:

- Flexibility in treating variable flows
- Iron removal
- Cost

It is anticipated that some variability in the flowrate and the contaminant concentrations in the groundwater will occur. Treating the variability will require some flexibility in the treatment system. The use of ozone combined with low concentrations of H_2O_2 will allow for more flexibility than using high concentrations of H_2O_2 only. If necessary, either the O_3 or H_2O_2 concentrations can be increased or lowered with the $UV/O_3/H_2O_2$ system. Only the H_2O_2 can be increased or lowered if required with the UV/H_2O_2 system. In addition, increasing the H_2O_2 concentration is limited and less effective if the H_2O_2 concentration is already high.

Iron will be removed primarily by filtering the iron oxide precipitate from the groundwater before treatment. The iron oxide precipitate (rust) is generated by the oxidation of dissolved iron. Hence, oxidizing the water before filtering increases the formation of the precipitate and improves iron removal. However, if the iron is not removed prior to entering the treatment system iron oxide may deposit on the UV lamps decreasing their effectiveness and life expectancy. Therefore, O_3 can be added on-line and upstream of the filtration unit promoting iron oxide precipitation and iron removal. H_2O_2 would not be as effective as ozone with this on-line system since it is not as strong of an oxidant and would likely require a longer retention time. H_2O_2 would also have to be added as a solution, thus increasing the volume in the pressurized influent line. O_3 is added as a dissolved gas with a negligible increase in

volume. For these reasons, the $UV/O_3/H_2O_2$ system is more appropriate for iron removal than the UV/H_2O_2 system.

The total cost associated with employing the $UV/O_3/H_2O_2$ treatment system is anticipated to be less than the UV/H_2O_2 system. Although capital costs will be higher for the $UV/O_3/H_2O_2$ system, daily costs associated with the high concentration of H_2O_2 required for the UV/H_2O_2 system are more than twice those for the $UV/O_3/H_2O_2$ system. Since the treatment system is anticipated to operate for roughly five years, these higher daily costs will exceed the capital cost associated with the O_3 generator given the anticipated duration of the project.

Treatability study test results indicate that the $UV/O_3/H_2O_2$ system will effectively reduce DCA and DCE below the required clean up levels. However, the tests also indicate that DCA is not as readily oxidized as DCE and 1,4-Dioxane. A carbon adsorption unit will therefore be added to the treatment system for removal of any residual DCA and DCE.

The contaminated groundwater at Kentec will be treated with an ULTROX® F-325 UV/oxidation reactor with a 14 lb/day O_3 generator and H_2O_2 feed system. The treatment system will also be equipped with an in-line filtration module placed upstream of the UV/oxidation reactor with a slip stream of ozone injected ahead of the filter to assist in oxidation and removal of iron. Two polyethylene carbon unit containing 165 pounds of granular activated carbon (GAC) will be placed in series at the effluent end of the UV/oxidation reactor.

Based on the effectiveness achieved in the treatability studies, the maximum flow that can be treated by this system will be 7,500 gpd. A schematic of the chemical oxidation system is shown in Figure 3-1.

WDCR532/001.51

Section a

Application Form

State of North Carolina
Department of Environment and Natural Resources
Division of Water Quality
Non-Discharge Permit Application Form
(THIS FORM MAY BE PHOTOCOPIED FOR USE AS AN ORIGINAL)

GROUNDWATER REMEDIATION SYSTEMS

This permit application form is for systems which use either infiltration galleries or injection wells to discharge treated groundwater into the subsurface. Each section of this application must be completed unless otherwise noted. Contact the Groundwater Section at (919) 715-6100 to obtain Groundwater Remediation Permit Application Guidelines.

I. GENERAL INFORMATION:

1. Applicant's name (please specify the name of the municipality, corporation, individual, etc.):
E.I. DuPont de Nemours & Company, Inc.

2. Print Owner's or Signing Official's name *and* title (the person who is legally responsible for the facility and its compliance): Clifford Lee, Environmental Manager

3. Mailing address: PO Box 800, Highway 11 North
City: Kinston State: NC Zip: 28502-0800
Telephone Number: (252) 522-6443

4. Project Name (please specify the name of the facility or establishment - should be consistent on all documents included in this application package: Kentec Facility

5. Location of Remediation Activities (Street Address): 4610 Braxton Road
City: Grifton State: NC Zip: 28530

6 County of Remediation Activities: Lenoir

7. Latitude: 35°20'59"N ; Longitude 77°27'22"W of Remediation Activities.

8. Contact person who can answer questions about application:
Name: Andrew Alcazar Telephone Number: (704) 362-6634

9. Application Date: 6/29/2001

10. Fee Submitted: $ 400. [The permit processing fee should be as specified in 15A NCAC 2H .0205(c)(5).]

II. PERMIT INFORMATION: Application No. (will be completed by DWQ): _____

1. Specify whether project is: X new; _____ renewal*; _____ modification
* For renewals, complete only sections I, II, and applicant signature (on page 8). Submit only pages 1, 2, and 8 (original and three copies of each). Engineer's signature not required for renewal without other modifications.

2. If this application is being submitted as a result of a renewal or modification to an existing permit, list the existing permit number _____ and its issue date _____

III. INFORMATION ON CONTAMINATED GROUNDWATER:

1. List the principal products or services provided by facility: Pack cleaning operation supporting the DuPont Dacron Facility located at Kinston, NC

2. Remediation Site Owner: ___ Federal; ___ State; X Private; ___ Public; ___ Native American Lands; ___ Other (specify) _____

3. Groundwater Incident Number (if known): Notice of Violation (Nov) issued February 4, 1991

4. Is this application for facilities subject to UST Trust Fund reimbursement? _____ Yes; X No.

5. Has a comprehensive site assessment and corrective action plan been submitted and approved for this project? X Yes; ____ No. Please provide two copies of each and two copies of the approval letter (if applicable).

6. Provide a brief description of the events or cause of the groundwater contamination: Inadequate Waste Water Treatment Waste Water discharged to Septic Drain, fields Leakage from two underground Waste Water Settling Tanks (no longer in use).

7. List contaminants detected: 1,4 - Dioxane
   1,1 - Dichloroethene
   1,1 - Dichloroethane

8. Volume of groundwater to be remediated per day: 8,640 gallons (per day)

9. Explanation of how volume was determined: Historical treatment of groundwater at 6 gallons per minute, 24 hours per day.

IV. GENERAL DESIGN INFORMATION:

1. Specify the type of system that is being installed: X infiltration gallery; _____ injection well; _____ other (specify): _____

2. Provide a brief description of all components of the treatment and disposal system (i.e., treatment units, pumps, tanks, chemical feed system, injection and/or recovery wells, etc.): Please refer to Attachment E and System Description

3. 15A NCAC 2C .0213 (Well Construction Standards, Applicable to Injection Wells) requires that contaminant levels in the fluid injected into any well be monitored; therefore, a sampling port must be provided on the effluent lines (treated water prior to being injected into the wells or infiltration gallery). The permit will specify the requirements for monitoring this effluent. Identify the location in the plans/specifications where the sampling port design is detailed:

Sampling Port exists after the carbon cannister units (last groundwater treatment step)

V. DESIGN INFORMATION FOR INFILTRATION GALLERIES:

1. Specify the dimensions of each infiltration gallery: (a) L= 250 ft. W= 18.5 ft. D= 1 ft.
   (b) L=____ ft. W=____ ft. D=____ ft.
   (c) L=____ ft. W=____ ft. D=____ ft.
2. The static groundwater level at the gallery location is 5 feet. The vertical separation between the gallery trench bottom and the mean seasonal high water table is 4 feet.
3. A North Carolina licensed soil scientist must provide an evaluation of the soils where the infiltration gallery will be located and must specify an acceptable loading rate (amount of water gallery can accept). This evaluation should determine whether the loading rate shall be based upon only the surface area of the infiltration gallery or whether it is appropriate to include some of the side wall depth.
   a. What is the area used to determine the loading rate? 4,625 square feet. This area should include only the surface area. No side wall depth should be included in this calculation.
   b. The recommended loading rate is 8,640 gallons per day (Attach all calculations).
   c. Indicate the theory behind the loading rate determination: See attached Soil Scientist Report (Attachment G)
4. Briefly describe any mounding of groundwater, above the static groundwater levels, that may result from infiltration (Attach calculations and/or diagrams): See attached Groundwater Modeling Report (Attachment I)

VI. DESIGN INFORMATION FOR INJECTION WELLS: N/A

1. Identify the principal aquifer to which the injection wells will be discharging:
2. Is the aquifer identified above the same aquifer from which the contaminated groundwater was extracted?
   ___ Yes ___ No. If No, describe how the aquifers are hydraulically related:
3. Briefly describe any mounding of groundwater, above the static groundwater levels, that may result from the injection (please attach calculations and/or diagrams):

4. Characteristics of injection well(s) [attach additional sheets if necessary]:

Injection Well Characteristics	Well A	Well B	Well C
Depth (feet)			
Diameter (inches)			
Injection rate (GPM)			
Injection volume (GPD)			
Injection pressure (PSI)			
Injection temp. (°C)			
Casing material			
Depth of casing (feet)			
Casing diameter (inches)			
Casing schedule number			
Cement grout (primary or inner casing)	from _____ ft. to _____ ft.	from _____ ft. to _____ ft.	from _____ ft. to _____ ft.
Cement grout (outer casing, if applicable)	from _____ ft. to _____ ft.	from _____ ft. to _____ ft.	from _____ ft. to _____ ft.
Screened or uncased interval (if applicable)	from _____ ft. to _____ ft.	from _____ ft. to _____ ft.	from _____ ft. to _____ ft.
Type of screen manufactured or hand slotted (if applicable)			
Screens inner diameter (inches-if applicable)			
Gravel pack (if applicable)	from _____ ft. to _____ ft.	from _____ ft. to _____ ft.	from _____ ft. to _____ ft.
Well contractor			
Contractor Registration No.			

VII. ADDITIONAL INFORMATION:

1. The applicable buffers should be met in accordance with 15A NCAC 2H .0200 and 15A NCAC 2H .0400. Some of those buffers are described below:

   a. 100 feet between injection wells or infiltration galleries and any private or public water supply source;
   b. 50 feet between injection wells and waters classified as WS, B, or other streams, canals, marshes, lakes, impoundments, or coastal waters;
   c. 100 feet between infiltration galleries and waters classified as WS, B, or other streams, canals, marshes, lakes, impoundments, or other coastal waters;
   d. 100 feet between injection wells or infiltration galleries and the mean high water of waters classified as SA or SB;
   e. 100 feet from injection well and infiltration gallery treatment and disposal systems and the normal high water of Class I and Class II impounded reservoirs which are used as a source of drinking water;
   f. 50 feet from injection well and infiltration gallery treatment and disposal systems and property lines.

   If any of the applicable buffers cannot be met, please explain how the proposed buffers will provide equal or better protection of the surface or groundwaters with no increased potential for nuisance conditions:

   Applicable buffers will be met in accordance with regulations stated above.

2. Substances may be added to enhance in situ treatment. If microbial additives or cultures are added in the effluent, the approval must be provided by the North Carolina Division of Epidemiology certifying its use for remediation purposes. In lieu of the Division of Epidemiology approval, risk assessment data, toxicological exposure data, or approval from another State may be provided certifying an exposure risks. Will any substances be added to the effluent to enhance in situ treatment? _____ Yes; __X__ No. If Yes, provide a detailed description of these substances, including amounts to be added. In addition, please attach any studies which describes the instances in which these substances have been used:

THIS APPLICATION PACKAGE WILL NOT BE ACCEPTED BY THE DIVISION OF WATER QUALITY UNLESS ALL OF THE APPLICABLE ITEMS ARE INCLUDED WITH THE SUBMITTAL

a. One original and three copies of the completed and appropriately executed application form.

b. The appropriate permit processing fee in accordance with 15A NCAC 2H .0205(c)(5).

c. Submit two copies of the Corrective Action Plan and comprehensive site assessment.

d. Four copies of the existing permit if a renewal or modification.

e. Four sets of detailed plans and specifications signed and sealed by a North Carolina Professional Engineer. The plans must include a general location map; a topographic map which extends one mile beyond property boundaries and depicts the facility and each of its intake and discharge structures (with the quadrangle name); a scaled site-specific map which indicates where borings or hand auger samples were taken; and a map showing the groundwater treatment/disposal facilities, buffers, structures and property lines. A map must also identify any hazardous waste treatment, storage, and disposal facilities; each well where fluids from the facility are injected underground; and those wells, springs and other surface water bodies and drinking water wells listed in public records or otherwise known to the applicant within a quarter mile of the facility property boundary. Each sheet of the plans, including any plan pages that are incorporated into a bound document, and the first page of the specifications, must be signed/sealed by a North Carolina Professional Engineer.

f. Four copies of a tabulation of data on all wells which are within the area of review and which penetrate the proposed injection zone. Such data shall include an identification number (same number referenced on map required in "e" above) for each well, a description of each well type, date installed, depth of well, and record of completion or abandonment (if available).

g. A soil scientist report which includes texture, color, and structure of the soils down to a depth of seven feet; depth, thickness and type of any restrictive horizons, hydraulic conductivity in the most restrictive horizon, Cation Exchange Capacity, depth of the mean seasonal high water table, soil pH, soil maps (if available, even if unpublished), and recommended loading rates (when using an infiltration gallery). This report must be signed by the soil scientist.

h. A hydrogeologic description, soils description, and cross section of the subsurface to a depth that includes the known or projected depth of contamination. The number of borings shall be sufficient to determine significant changes in lithology, the vertical permeability of the unsaturated zone, the hydraulic conductivity of the saturated zone, the depth to the mean seasonal high water table, and a determination of transmissivity and specific yield of the unconfined aquifer (show calculations used for transmissivity and specific yield). Report should also indicate whether the aquifer is attributable to fracture porosity storage or stratigraphically controlled (bedding plane). Include a general map and cross section illustrating the regional geologic setting.

i. Describe the proposed injection procedure and describe expected changes in pressure and direction of movement of injected fluid (provide data from fracture studies where applicable). Applicant must demonstrate complete hydraulic control over contaminant plume and injectate if injectate does not meet 2L standards.

j. Proposal for groundwater monitoring (e.g., schedule, analytical methods, etc.).

k. Describe the method for determining mechanical integrity of injection well over a five year period.

l. A complete analysis of the contaminated groundwater to include, but not limited to BTEX, volatile and semivolatile compounds, pH, nitrates, and phosphates or any additional information the Director deems necessary to evaluate the proposed treatment and disposal system.

m. Describe contaminant concentrations in the effluent given the proposed treatment. Include expected treatment efficiency. Provide calculations or documentation to show how proposed degree of treatment was derived.

n. Diagram of the contaminant plume both horizontally and vertically, including vadose zone contamination (isoconcentration maps and plume cross sections). Include direction of groundwater flow for both surface aquifer and deep aquifers.

o. Four copies of all reports, evaluations, agreements, supporting calculations, etc., must be submitted as a part of the supporting documents which are signed and sealed by the North Carolina Professional Engineer. Although certain portions of this required submittal must be developed by other professionals, inclusion of these materials under the signature and seal of a NC PE signifies that he or she has reviewed this material and has judged it to be consistent with his or her proposed design.

Name and Complete Address of Engineering Firm: URS Corporation

5301 77 Center Drive, Suite 41

City: Charlotte State: NC Zip: 28217

Telephone Number: (704) 522-0330 Fax Number: (704) 522-0063

Professional Engineer's Certification:

I, Mark Robinson, P.E., attest that this application for a non-dishcarge permit (Groundwater Remediation Systems) has been reviewed by me and is accurate and complete to the best of my knowledge. I further attest that to the best of my knowledge the proposed design has been prepared in accordance with the applicable regulations. Although certain portions of this submittal package may have been developed by other professionals, inclusion of these materials under my signature and seal signifies that I have reviewed this material and have judged it to be consistent with the proposed design.

North Carolina Professional Engineer's Seal, Signature, and Date:

Applicant's Certification:

I, Clifford O. Lee, attest that this application for a non-discharge permit at the DuPont Kentec facility. has been reviewed by me and is accurate and complete to the best of my knowledge. I understand that if all required parts of this application are not completed and that if all required supporting information and attachments are not included, this application package will be returned to me as incomplete.

Signature _____ Date _____

THE COMPLETED APPLICATION PACKAGE, INCLUDING ALL SUPPORTING INFORMATION AND MATERIALS, SHOULD BE SENT TO THE FOLLOWING ADDRESS:

NORTH CAROLINA DIVISION OF WATER QUALITY

WATER QUALITY SECTION

NON-DISCHARGE PERMITTING UNIT

POST OFFICE BOX 29535

RALEIGH, NORTH CAROLINA 27626-0535

TELEPHONE NUMBER: (919) 733-5083

FAX NUMBER: (919) 733-0719

DIVISION OF WATER QUALITY REGIONAL OFFICES

Asheville Regional WQ Supervisor
59 Woodfin Place
Asheville, NC 28801
(828) 251-6208
Fax (828) 251-6452

Avery	Macon
Buncombe	Madison
Burke	McDowell
Caldwell	Mitchell
Cherokee	Polk
Clay	Rutherford
Graham	Swain
Haywood	Transylvania
Henderson	Yancey
Jackson	

Washington Regional WQ Supervisor
943 Washington Square Mall
Washington, NC 27889
(252) 946-6481
Fax (252) 975-3716

Beaufort	Jones
Bertie	Lenoir
Camden	Martin
Chowan	Pamlico
Craven	Pasquotank
Currituck	Perquimans
Dare	Pitt
Gates	Tyrell
Greene	Washington
Hertford	Wayne
Hyde	

Raleigh Regional WQ Supervisor
Post Office Box 27687
Raleigh, NC 27611
(919) 571-4700
Fax (919) 571-4718

Chatham	Nash
Durham	Northampton
Edgecombe	Orange
Franklin	Person
Granville	Vance
Halifax	Wake
Johnston	Warren
Lee	Wilson

Fayetteville Regional WQ Supervisor
225 Green Street, Suite 714
Fayetteville, NC 28301
(910) 486-1541
Fax (910) 486-0707

Anson	Moore
Bladen	Robeson
Cumberland	Richmond
Harnett	Sampson
Hoke	Scotland
Montgomery	

Mooresville Regional WQ Supervisor
919 North Main Street
Mooresville, NC 28115
(704) 663-1699
Fax (704) 663-6040

Alexander	Lincoln
Cabarrus	Mecklenburg
Catawba	Rowan
Cleveland	Stanly
Gaston	Union
Iredell	

Wilmington Regional WQ Supervisor
127 Cardinal Drive Extension
Wilmington, NC 28405-3845
(910) 395-3900
Fax (910) 350-2004

Brunswick	New Hanover
Carteret	Onslow
Columbus	Pender
Duplin	

Winston-Salem Regional WQ Supervisor
585 Waughtown Street
Winston-Salem, NC 27107
(336) 771-4600
Fax (336) 771-4631

Alamance	Rockingham
Alleghany	Randolph
Ashe	Stokes
Caswell	Surry
Davidson	Watauga
Davie	Wilkes
Forsyth	Yadkin
Guilford	

Section b

Processing Fee

Section c

Corrective Action Plan
Comprehensive Site Assessment

Section d

N/A – No Prior Permit

Section f

Well Data

DuPont Kentec Monitoring Well Construction Details

Well	Ground Elevation (Above MSL)	Depth to Top of Bentonite	Depth to Top of Sand	Depth to Top of Screen	Depth to Bottom of Screen	Length of Screened Interval (Feet)	Depth to Bottom of 6-inch Casing	Total Borehole Depth	Date Installed
MW-1	29	3	4	5	15	10	--	15	1990
MW-2	30	3	4	5	15	10	--	15.5	1990
MW-3	29.5	2	3	5	15	10	--	15	1990
MW-4	30.6	3	4	5	15	10	--	15	1990
MW-4B	30.4	39	43	46	56	10	15.17	56	10/5/89
MW-5	30.6	3	4	5	15	10	--	15	1990
MW-6	28.5	3	4	5	15	10	--	15	1990
MW-7	27.9	2.5	3	5	10	5	--	10	1990
MW-7B	27.8	29.5	33.5	36	46	10	9.75	46	10/9/89
MW-8	29	2.5	4	4	9	5	--	10	1990
MW-9	29.7	2.5	4	5	10	5	--	10	--
MW-10A	30.6	3	5.25	6	12.5	6.5	--	12.5	10/5/89
MW-10B	30	36.5	42.42	45	55	10	14	57	8/1/90
MW-10C	30.9	72	79	83	93	10	15	102	1/31/91
MW-11A	30.1	3.08	4.5	5.5	9	3.5	--	9	10/5/89
MW-11B	30.5	34	46	48.5	58.5	10	15.5	60	1/29/91
MW-11C	30.2	77	84	87	97	10	15	102	1/29/91
MW-12	27.5	2.83	5	6.25	9.5	3.25	--	9.5	10/5/89
MW-13	27.1	3	4.5	5.67	8.83	3.17	--	8.83	10/6/89
MW-14A	25.4	2.08	2.75	3.5	8	4.5	--	8.08	1/24/90
MW-14B	25.3	31	34.83	40.5	50.5	10	9	52	1/26/90
MW-15	25.2	3	4	4.83	8.5	3.67	--	8.5	1/25/90
MW-16	29.5	3.67	5	6.33	9.83	3.5	--	12.75	1/23/90
MW-17C	30.5	76	84	89	99	10	13	102	2/5/91

Depths are in feet below ground surface.
MSL - Mean Sea Level
Note: All wells are 2" diameter schedule 40 PVC.

Section g

Soil Scientist Report

ENGINEERING CONSULTING SERVICES, LTD.
Geotechnical Construction Materials Environmental

Date: May 25, 2001

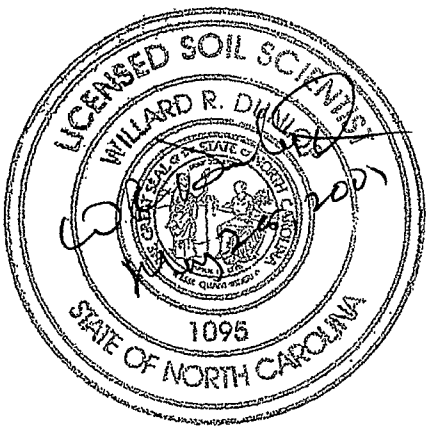
To: Mr. Marc Harder, P.G.
DuPont Engineering Corporate Remediation Group

From: W. R. (Bill) Dunlop, Jr., LSS
Principal Scientist

Subject: Soil Scientist's Report
Proposed Infiltration Gallery Site
Kentec Facility, Kinston, NC
ECS Project No. 06.9404

Attached is the Soil Scientist's Report that you requested for the subject project. It is our opinion that the site soils are suited for the use proposed.

Thank you for allowing us to assist you. If you need further assistance or explanation of the results of this project please call.



P.O. Box 12015, Research Triangle Park, North Carolina 27709 (919) 544-1735 Fax (919) 544-0810 1-800-327-5832 www.ecslimited.com

Offices: Baltimore, MD · Frederick, MD · Aberdeen, MD · Chantilly, VA · Winchester, VA · Fredericksburg, VA · Richmond, VA · Roanoke, VA · Danville, VA
Norfolk, VA · Williamsburg, VA · Charlotte, NC · Raleigh, NC · Greensboro, NC · Wilmington, NC · Greenville, SC · Atlanta, GA · Chicago, IL

SOIL SCIENTIST'S REPORT
PROPOSED INFILTRATION GALLERY SITE
KENTEC FACILITY
KINSTON, NORTH CAROLINA

Introduction

A treated groundwater infiltration gallery is proposed for the Kentec facility located on Braxton Road, north of Kinston, North Carolina. Groundwater containing certain chemical constituents is recovered by a network of trenches, treated on the subject site to remove the majority of the constituents of concern, and at high cost, transported by rail to another facility for disposal. The groundwater collection system makes use of normal groundwater flow to move the impacted groundwater to the recovery trenches for collection. The intent of installing a treated groundwater infiltration gallery is to speed the movement of the constituents to the recovery trenches, hastening the clean-up effort.

Published Soil Survey Information

Soil information for the subject site area is contained in the *Soil Survey of Lenoir County, North Carolina* (USDA-SCS, 1977). Soil survey map No. 7 (attached) indicates that the soils in the area of the Kentec facility, including the proposed infiltration gallery, have been mapped as Lakeland sands (La, 0 to 6 percents slopes).

Lakeland soils are described as excessively drained soils found on uplands and stream terraces. Their permeability is rapid and available water capacity is low. The seasonal high water table (SHWT) remains below a depth of about 5 feet. They are sandy throughout the profile. Small areas of soils having layers of loamy sand below the surface layer, Blanton soils, Kenansville soils, and Leon soils are also sometimes included in Lakeland mapping units.

Field Observations

Hand auger borings were made to a depth of approximately 7 feet in nine locations in the area of interest. The approximate locations of the hand auger borings are depicted on the attached field drawing. Notes on soil texture, color, structure, restrictive horizons, etc. were made in the field. The field soil profile descriptions are attached for reference.

An attempt to measure the in-situ saturated hydraulic conductivity (K_{sat}) of the site soils was made in the area of hand auger boring HA-2. That location was chosen because the soils there are representative of the soils in the proposed area of the infiltration gallery. It is our opinion that the soils are rapidly permeable, as described by the SCS soil survey report. An attempt was made, nevertheless, to measure the K_{sat} using a compact constant head permeameter ("Amoozemeter").

Our observations of the site soils indicate that they are intermediate in character to the Lakeland and Kenansville soils (official USDA-NRCS descriptions attached). An argillic

(B_t) horizon is present, unlike the Lakeland soils, but with less clay than is typical of the Kenansville series. The soils are excessively well drained with a SHWT estimated to be below 60 inches. The soils are sandy with either a layer of clay coated sand or enough fines to form an argillic horizon that is a light loamy sand or loamy sandy. Two of the profiles had a light sandy loam B_t horizon.

Because of the sandy nature of the soils and the kaolinitic clay type typical of the subject area, the CEC of the site soils is estimated to be <5 meq/100 grams. The soil pH is also expected to be <6.0 S.U. because the area has not been managed for agricultural use for some time. Data published by the USDA-SCS indicates that the K_{sat} for both the Lakeland and Kenansville soils is 6.0 to 20 inches/hour. Our attempt to measure the K_{sat} was not successful because the permeability of the soils at the test location was greater than the CCHP was able to measure. The estimated K_{sat} is >6 inches/hour.

Conclusions

It is the intent of the project engineers to use treated groundwater to drive untreated groundwater to recovery trenches, thence to the treatment system for removal of the chemical constituents of concern. We understand that computer modeling was used to determine the infiltration gallery area and that the proposed application rate is to be about 1.87 gal/ft^2/day (8640 gals/day, 4625 ft^2 gallery area). It is our opinion that the soils located at the proposed infiltration gallery site are suitable to receive the treated groundwater at the application rate proposed.

FIGURES

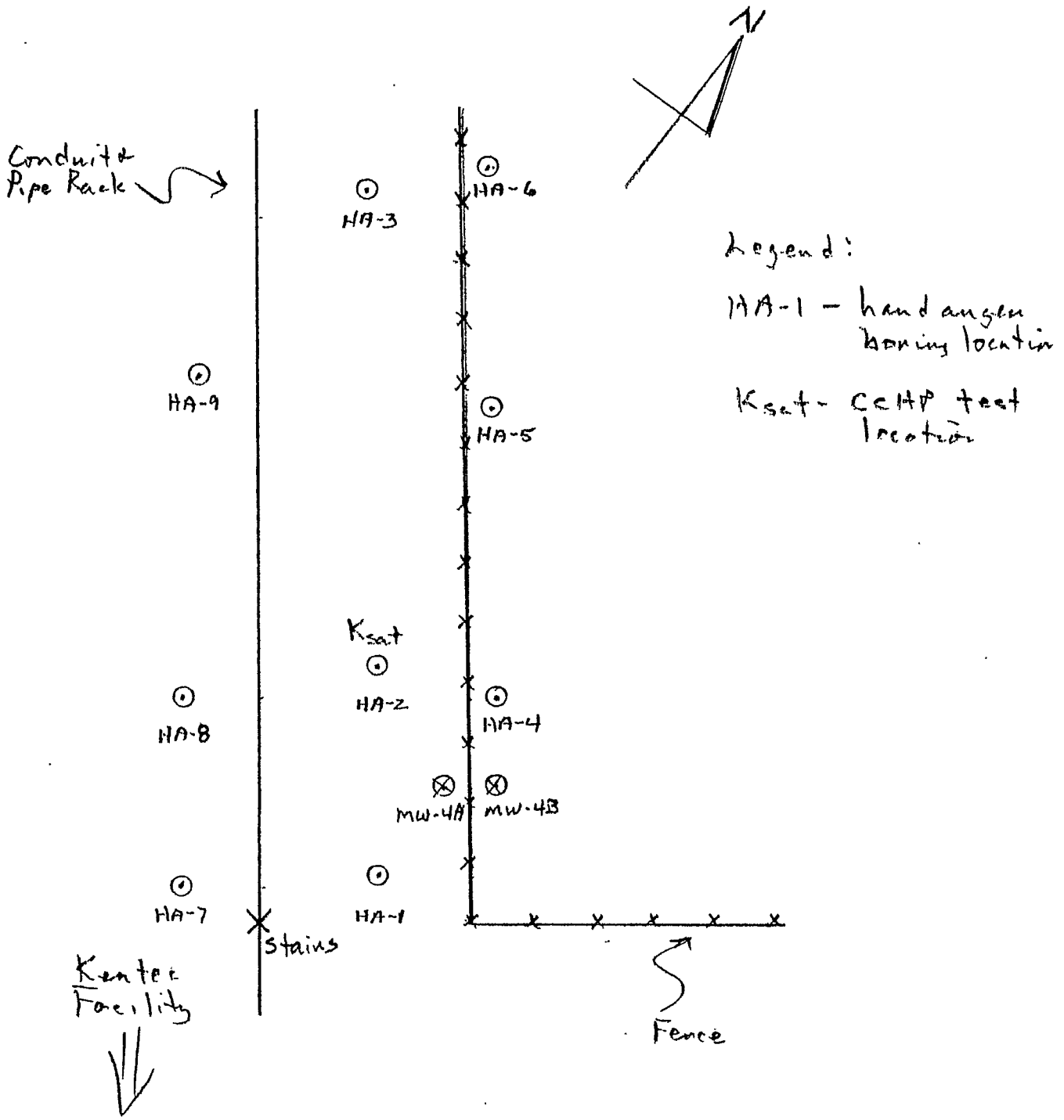
ENGINEERING CONSULTING SERVICES, LTD.

PROJECT: Kentec Infiltration		FIGURE NO. 1
TITLE: Soil Survey Map No. 7		JOB NO. 06.9404
		SCALE: 1:20000
BY: C.O. Rowland	DATE: May 28, 2001	APPROVED BY: — DATE —

ENGINEERING CONSULTING SERVICES, LTD.

CALCULATION SHEET

PROJECT: Kenter Infiltration			FIGURE NO. 2
TITLE: Approximate Locations of Hand Auger Borings & Ksat Measurement			JOB NO. 06.9404
			SCALE: 1" = 30'
BY: W.R. Dunlop	DATE: May 21, 2001	APPROVED BY: —	DATE —



FIELD SOIL PROFILE DESCRIPTIONS

SOIL PROFILE DATA SHEET

Date May 10, 2001	Site Kentree Kinston, NC	County Lenoir
Description By L.R. Dunlap Jr.	Mapping Unit Ls	Photo 7

Remarks

Profile No. HA-1

Percent Slope <2 | Free Water — | Erosion slight

Position on Slope — | Vegetation grass

Horizon	Depth	Color	Texture	Structure	Consistence	Mottles	Fragments	Clay Films	pH
	0-6	10YR 5/4	s	sg	l				
	6-14	10YR 6/8	s	sg	l				
	14-28	10YR 6/6	s	sg	l				
	28-42	10YR 5/6	ls	1msgr	vfr				
	42-52	10YR 6/8	ls	1msgr	vfr	10YR 5/8			
	52-58	10YR 5/6	ls	1msgr	vfr				
	58-64	10YR 6/4	s	sg	l	2.5YR 5/8			
	64-71	2.5Y 6/4	s	sg	l				

Additional Notes - believed to be in area of old drainfield, undisturbed low

sat 64"

Series

Profile No. HA-1 (cont'd)

Percent Slope <2 | Free Water — | Erosion —

Position on Slope | Vegetation

Horizon	Depth	Color	Texture	Structure	Consistence	Mottles	Fragments	Clay Films	pH
	71-80	2.5Y 6/3	s (co)	sg	l	2.5Y 5/2			
	80-84	2.5Y 5/3	s (co)	sg	l	2.5Y 5/2			

Additional Notes

Series

Profile No. HA-2

Percent Slope <2 | Free Water — | Erosion slight

Position on Slope — | Vegetation grass

Horizon	Depth	Color	Texture	Structure	Consistence	Mottles	Fragments	Clay Films	pH
	0-6	10YR 5/4	s	sg	l				
	6-24	10YR 5/6	s	sg	l				
	24-36	10YR 5/6	ls	1msgr	vfr				
	36-47	10YR 5/6	ls	1msgr	vfr	10YR 5/8			
	47-58	2.5Y 6/6	s	sg	l				
	58-63	2.5Y 6/3	s (co)	sg	l				
	63-72	2.5Y 5/3	s (co)	sg	l				
	72-84	2.5 6/3				2.5Y 6/1			

Additional Notes sat 63"

Series

SOIL PROFILE DATA SHEET

Date May 10, 2001	Site Kentec, Kinston, NC	County Lenoir
Description By WP Dunlap Jr	Mapping Unit La	Photo 7
Remarks		

Profile No. HA-3

Percent Slope 2 | Free Water — | Erosion slight

Position on Slope — | Vegetation grass

Horizon	Depth	Color	Texture	Structure	Consistence	Mottles	Fragments	Clay Films	pH
	0-8	10YR 5/3	s	sg	l				
	8-36	10YR 5/6	s	sg	l				
	36-52	10YR 5/6	ls	1mgr	vfr	10YR 6/8			
	52-68	2.5Y 6/4	s	sg	l	10YR 6/8			
	68-76	10YR 6/6	sl	1mgr	vfr	10YR 6/8			
	76-80	10YR 5/6	s (co)	sg	l	10YR 6/8			
	80-82	10YR 2/1	s (co)	sg	l				

Additional Notes sat @ 60"

Series

Profile No. HA-4

Percent Slope 2 | Free Water — | Erosion slight

Position on Slope — | Vegetation grass

Horizon	Depth	Color	Texture	Structure	Consistence	Mottles	Fragments	Clay Films	pH
	0-8	10YR 5/3	s	sg	l				
	8-20	10YR 5/6	s	sg	l				
	20-38	10YR 5/6	ls	1mgr	vfr				
	38-53	10YR 5/6	ls	1mgr	vfr	10YR 6/8			
	53-63	2.5Y 6/4	s	sg	l	10YR 6/8			
	63-73	10YR 6/6	s (cu)	sg	l	10YR 6/8			
	73-78	2.5Y 6/4	s	sg	l				
	78-84	2.5Y 5/3	s (cu)	sg	l				

Additional Notes sat @ 60"

Series

Profile No. HA-5

Percent Slope 2 | Free Water — | Erosion slight

Position on Slope — | Vegetation grass

Horizon	Depth	Color	Texture	Structure	Consistence	Mottles	Fragments	Clay Films	pH
	0-6	10YR 5/3	s	sg	l				
	6-20	10YR 5/6	s	sg	l				
	20-36	10YR 5/6	ls	1mgr	vfr				
	36-52	10YR 5/6	ls	1mgr	vfr	10YR 6/8			
	52-58	2.5Y 6/4	s	sg	l				
	58-80	2.5Y 6/4	ls	1mgr	vfr	10YR 6/8	10YR 6/2		
	80-84	2.5Y 5/2	s (co)	sg	l	10YR 2/1			

Additional Notes sat @ 58"

Series

SOIL PROFILE DATA SHEET

Date May 10, 2001	Site Kenfec, Kinston, NC	County Lenoir
Description By WR Dunlap, Jr	Mapping Unit La	Photo 7
Remarks		

Profile No. HA-6

Percent Slope ± 2 | Free Water — | Erosion slight

Position on Slope — | Vegetation same as

Horizon	Depth	Color	Texture	Structure	Consistence	Mottles	Fragments	Clay Films	pH
	0-8	10YR 5/3	s	sg	l				
	8-18	10YR 5/4	s	sg	l				
	18-34	10YR 5/8	ls	1mgr	vfr				
	34-48	10YR 5/4	ls	1mgr	vfr	7.5YR 6/8			
	48-64	2.5Y 6/6	s	sg	l				
	64-80	10YR 6/6	s (ca)	sg	l	7.5YR 6/8			
	80-84	2.5Y 5/2	s (ca)	sg	l	10YR 7/1			

Additional Notes sat at 60"

Series

Profile No. HA-7

Percent Slope ± 2 | Free Water — | Erosion slight

Position on Slope — | Vegetation same as

Horizon	Depth	Color	Texture	Structure	Consistence	Mottles	Fragments	Clay Films	pH
	0-8	10YR 5/3	s	sg	l				
	8-16	2.5Y 6/4	s	sg	l				
	16-56	10YR 5/6	ls	1mgr	vfr	7.5YR 5/6			
	56-68	10YR 5/6	ls	1mgr	vfr	7.5YR 5/8			
	68-79	10YR 5/4	s	sg	l	7.5YR 5/8	10YR 5/1		
	79-84	2.5Y 6/1	s	sg	l	2.5Y 5/1			

Additional Notes sat at 60"

Series

Profile No. HA-8

Percent Slope ± 2 | Free Water — | Erosion slight

Position on Slope — | Vegetation same as

Horizon	Depth	Color	Texture	Structure	Consistence	Mottles	Fragments	Clay Films	pH
	0-8	10YR 5/3	s	sg	l				
	8-15	10YR 5/6	s	sg	l				
	15-44	2.5Y 6/4	ls	1mgr	vfr				
	44-54	2.5Y 6/3	ls	1mgr	vfr	10YR 6/8			
	54-58	2.5Y 6/2	ls	1mgr	vfr	10YR 6/8	2.5Y 7/1		
	58-64	2.5Y 6/4	s (ca)	sg	l				
	64-72	2.5Y 5/3	ls	1mgr	vfr	10YR 6/8			
	72-80	2.5Y 6/2	ls	1mgr	vfr	2.5Y 7/1	10YR 6/8		

Additional Notes 80-84 2.5Y 5/2 s 2.5Y 7/1

sat 60"

Series

SOIL PROFILE DATA SHEET

Date May 10, 2001	Site Kenfield, Kinston, NC	County Lenoir
Description By D R Duncan, Jr	Mapping Unit La	Photo 7
Remarks		

Profile No. HA-9

Percent Slope 2 | Free Water — | Erosion slight

Position on Slope — | Vegetation grass

Horizon	Depth	Color	Texture	Structure	Consistence	Mottles	Fragments	Clay Films	pH
	0-10	10YR 5/3	s	sg	l				
	10-20	2.5Y 6/4	ls-	1 mgr	vfr				
	20-34	2.5Y 6/4	ls	1 mgr	vfr				
	34-48	2.5Y 6/3	ls-	1 mgr	vfr				
	48-58	2.5Y 6/3	sl-	1 msbk	fr				
	58-72	2.5Y 5/4	sl-	1 msbk	fr	10YR 6/2	10YR 6/8		
	72-80	2.5Y 5/3	s (co)	sg	l	10YR 6/2			
	80-84	2.5Y 6/2	s (co)	sg	l	10YR 6/1			

Additional Notes

Series

Profile No. _____

Percent Slope | Free Water | Erosion

Position on Slope | Vegetation

Horizon	Depth	Color	Texture	Structure	Consistence	Mottles	Fragments	Clay Films	pH

Additional Notes

Series

Profile No. _____

Percent Slope | Free Water | Erosion

Position on Slope | Vegetation

Horizon	Depth	Color	Texture	Structure	Consistence	Mottles	Fragments	Clay Films	pH

Additional Notes

Series

OFFICIAL SOIL SERIES DESCRIPTIONS

LOCATION LAKELAND FL+AL GA LA MD MS NC NJ SC VA

Established Series
Rev. AGH
6/92

LAKELAND SERIES

The Lakeland series consists of very deep, excessively drained, rapidly permeable soils that formed in thick beds of eolian or marine sands. Slopes are dominantly 0 to 12 percent but range to 85 percent in dissected areas.

TAXONOMIC CLASS: Thermic, coated Typic Quartzipsamments

TYPICAL PEDON: Lakeland sand--forested. (Colors are for moist soil.)

A--0 to 3 inches; very dark brown (10YR 3/2) crushed and rubbed sand; single grained; loose; common uncoated sand grains; common fine and medium roots; strongly acid, clear wavy boundary. (2 to 9 inches thick)

C1--3 to 10 inches; yellowish brown (10YR 5/4) sand; common medium faint yellowish brown (10YR 5/6) mottles; single grained; loose; common fine and medium roots; few uncoated sand grains; strongly acid; gradual wavy boundary.

C2--10 to 43 inches; yellowish brown (10YR 5/8) sand; single grained; loose; few fine roots; few uncoated sand grains; strongly acid; gradual wavy boundary.

C3--43 to 64 inches; yellowish brown (10YR 5/8) sand; few medium faint pale brown (10YR 7/3, 7/4) mottles; single grained; loose; many uncoated sand grains; strongly acid; gradual wavy boundary.

C4--64 to 80 inches; very pale brown (10YR 7/4) sand; few medium distinct yellowish red (5YR 4/8) mottles; single grained; loose; many uncoated sand grains; strongly acid. (The C horizon extends to 80 inches or more.)

TYPE LOCATION: Calhoun County, Florida; 6 miles west of Chason, Florida on State Highway 274 NE1/4NE1/4, sec. 31, T. 2 N., R. 10 W.

RANGE IN CHARACTERISTICS: All horizons are sand or fine sand with 5 to 10 percent silt plus clay in the 10- to 40- inch control section. The soil is very strongly acid through moderately acid throughout except where limed.

The A horizon has hue of 10YR or 2.5Y, value of 3 to 5, and chroma of 1 to 4.

The C horizon has hue of 10YR, value of 4 to 7, and chroma of 3 to 8; hue of 2.5Y, value of 7 or 8, and chroma of 4 to 8; or hue of 7.5YR or 5YR, value of 5 or 6, and chroma of 6 or 8.

Most of the sand grains between 10 and 40 inches are coated. Small pockets of light gray or white sand grains or yellow or brown mottles may occur in some pedons below depths of 40 inches. Some pedons have an A/C horizon that is a mixture of gray and yellowish brown.

COMPETING SERIES: These are the Alaga, Alpin, Bigbee, Cainhoy, Catpoint, Darden, Duffern, Foxworth, Glentosh, Tonkawa and Wando series. Alaga and Darden soils have 10 to 25 percent silt plus clay in the 10 to 40 inch control section. Alpin and Catpoint soils have lamella that totals less than 6 inches thick within depths of 80 inches. Bigbee and Foxworth soils have a seasonal water table within depths of 48 inches. Cainhoy soils have a Bh horizon. Duffern and Tonkawa soils are dry in some parts of the moisture control section for more than 125 days. Glentosh soils can have loamy fine sand textures and they are drier. Wando soils are loamy fine sand or fine sand to a depth of 40 to 60 inches and commonly contain more silt plus clay.

GEOGRAPHIC SETTING: Lakeland soils are on broad, nearly level to very steep uplands in the Lower Coastal Plain. Slope gradients are commonly 0 to 12 percent but may range up to 85 percent in highly dissected areas. The soil formed in marine, eolian, or fluvial sands. Mean annual precipitation is about 45 to 60 inches and mean annual air temperature is about 62 to 71 degrees F.

GEOGRAPHICALLY ASSOCIATED SOILS: These are the competing Foxworth soils, and Chipley, Kershaw, Kureb, Osier, Plummer, Troup, and Wakulla soils. Chipley soils occur closer to streams or in hillside seep areas. They have chroma of 2 or less between 20 and 40 inches and are seasonally wet. Kureb soils occur in the coastal areas. They have less than 5 percent silt plus clay in the 10- to 40- inch control section, and they have light gray E horizons. Kershaw soils have less than 5 percent silt plus clay in the 10- to 40- inch control section. Osier and Plummer soils are poorly drained and occur along drainageways. Troup soils occur in the same landscape with Lakeland, and they have Bt horizons. Wakulla soils have Bt horizons, and they occur on more gently sloping areas of upland plains and stream terraces.

DRAINAGE AND PERMEABILITY: Excessively drained, rapid permeability, slow runoff. Depth to seasonal water table is more than 80 inches.

USE AND VEGETATION: Natural vegetation consists of blackjack, turkey and post oak; scattered longleaf pine; and an understory of creeping bluestem, sandy bluestem, lopsided indiangrass, hairy panicum, fringeleaf paspalum and native annual forbs. Many areas are cleared and used for peanuts, watermelons, peaches, corn, tobacco, and tame pasture.

DISTRIBUTION AND EXTENT: Atlantic and Gulf Coastal Plain and sandhills of the thermic belt from Texas to Virginia. The series is extensive.

MLRA OFFICE RESPONSIBLE: Auburn, Alabama

SERIES ESTABLISHED: Alachua County, Florida; 1947.

REMARKS: Diagnostic horizons and features in this pedon:

Ochric epipedon - 0 to 3 inches (A horizon).

Established Series
CWS:ENH, Rev MHC
07/1999

KENANSVILLE SERIES

The Kenansville series consists of well drained, nearly level to gently sloping soils on Coastal Plain uplands and stream terraces. They have formed in marine and fluvial sediments. Slopes range from 0 to 10 percent.

TAXONOMIC CLASS: Loamy, siliceous, subactive, thermic Arenic Hapludults

TYPICAL PEDON: Kenansville loamy sand - in a cultivated field on a 2 percent slope. (Colors are for moist soil unless otherwise stated.)

Ap--0 to 8 inches, grayish brown (10YR 5/2) loamy sand; weak medium granular structure; very friable; common fine roots; moderately acid; abrupt smooth boundary. (6 to 10 inches thick)

E--8 to 24 inches, light yellowish brown (10YR 6/4) loamy sand; weak medium granular structure; very friable; few fine roots; moderately acid; gradual wavy boundary. (14 to 30 inches thick)

Bt--24 to 36 inches, yellowish brown (10YR 5/8) sandy loam; weak medium subangular blocky structure; very friable; common fine roots and pores; sand grains coated and bridged with clay; very strongly acid; gradual wavy boundary. (6 to 35 inches thick)

BC--36 to 42 inches, yellowish brown (10YR 5/8) loamy sand; weak medium granular structure; very friable; few fine roots and pores; clay coatings on sand grains; few bridging of sand grains by clay; strongly acid; gradual wavy boundary. (4 to 22 inches thick)

C--42 to 84 inches, very pale brown (10YR 7/3) sand; few fine distinct strong brown and common medium faint light gray (10YR 7/2) iron depletions; single grained; loose; strongly acid.

TYPE LOCATION: Lenoir County, North Carolina; 11 miles northeast of Kinston and 1.2 miles northwest of Grifton; 100 feet northeast of intersection of North Carolina Highway 11 and State Road 1704; in a cultivated field.

RANGE IN CHARACTERISTICS: Solum thickness ranges from 40 to 60 inches. The soil ranges from very strongly through moderately acid in all horizons, unless limed.

The A or Ap horizon has hue of 7.5YR to 2.5Y, value of 3 to 6, and chroma of 1 to 4. The A horizon is less than 6 inches thick if its color value, moist, is less than 3.5. Texture is loamy sand, loamy fine sand, sand, or fine sand.

The E horizon has hue of 10YR or 2.5Y, value of 5 to 8, and chroma of 3 to 8. Texture is similar to the A or Ap horizon.

The BE horizon, where present, has hue of 10YR or 2.5Y, value of 5 to 8, and chroma of 3 to 6. Texture is loamy sandy, loamy fine sand or sandy loam.

The Bt horizon has hue of 7.5YR to 2.5Y, value of 5 to 7, and chroma of 4 to 8. Texture is sandy loam or fine sandy loam. Thin layers of sandy clay loam are present in some pedons.

The BC, or B/C horizon, where present, has similar matrix color as the Bt horizon. Texture is sand, loamy sand, sandy loam or fine sandy loam.

The C horizon has hue of 7.5YR to 2.5Y, value of 4 to 8, and chroma of 1 to 8. Texture is sand or loamy sand.

COMPETING SERIES: (This section not checked this date; added activity class) The Baymeade, Blaney, Chipola, Chisolm, Coosaw, Garcon, Gomery, Remlik, Tenaha, Tomahawk, Uchee, and Valhalla series are in the same family. Alaga, Bassfield, Conetoe, Eustis, Galestown, Kamia, Latonia, Maxton, Molena, Pocalla, Rumford, Valhalla, Wagram, and Wakulla series are in closely related family. Baymead soils have A and B horizons with irregular intermittent Bh bodies. Blaney soils have a Bt horizon that is compact and brittle in part of the mass. Chipola and Chisolm soils have Bt horizons with redder hues. Coosaw and Garcon soils have low chroma mottles in the lower Bt horizon. Also, Garcon have less clayey Bt horizons. Gomery and Tenaha soils are underlain by soft bedrock. Remlik soils have common lamellae in the C horizon and are commonly on 6 to 45 percent slopes. Tomahawk soils have Bh horizon in lower part of solum. Also, they are somewhat poorly drained. Uchee soils have a clayey lower Bt horizon with moderately slow permeability. Valhalla soils have buried E and Bt horizons. Alaga, Eustis, Galestown, Molena, and Wakulla soils have coarser textures. In addition, Galestown soils are mesic and Molena soils have mixed mineralogy. Bassfield and Lotonia soils lack the arenic surface layer. Conetoe soils have mixed mineralogy. Kalmia and Maxton soils thinner A horizon and finer textures Bt horizon. Pocalla soils are bisequal. Rumford soils have thinner A horizons and redder Bt horizons. Wagram soils have thicker sola.

GEOGRAPHIC SETTING: Kenansville soils are on nearly level to gently sloping Coastal Plain uplands and stream terraces. They formed in Coastal Plain and stream terrace sediments. Kenansville soils generally are on the smoother parts of the landscape between the higher, sandier ridges and the lower wet areas. Slope gradients are commonly 0 to 4 percent with a full range up to 10 percent. Average annual precipitation is about 48 inches and mean annual temperature is about 63 degrees F. near the type location.

GEOGRAPHICALLY ASSOCIATED SOILS: These are the competing Eustis, Kalmia, Wagram, and Wakulla series and the Cahaba, Eunola, Foreston, Johns and Lakeland series. Cahaba, Eunola, and Foreston soils lack thick sandy epipedons. Johns soils have low chroma mottles indicative of wetness in the Bt horizon. Lakeland soils are sandy and do not have Bt horizons.

DRAINAGE AND PERMEABILITY: Well drained; slow runoff; moderately rapid permeability. A seasonal water table is below 4.0 feet for the wet substratum phase.

USE AND VEGETATION: Most areas are cleared and used for crops. Tobacco, corn, cotton, peanuts, and soybeans are the principal crops. Forested areas are in mixed hardwoods and pine. Native trees include oaks, hickory, dogwoods, and longleaf and loblolly pine.

DISTRIBUTION AND EXTENT: Coastal Plain of North Carolina, Delaware, South Carolina, and Virginia. The series is of moderate extent.

MLRA OFFICE RESPONSIBLE: Raleigh, North Carolina

SERIES ESTABLISHED: Duplin County, North Carolina; 1955.

REMARKS: Diagnostic horizons and features recognized in this pedon are:

Ochric epipedon - the zone from the surface to a depth of 24 inches (the Ap and E horizons)

Arenic feature - the zone with sandy textures from the surface to 24 inches (the Ap and E horizons)

Argillic horizon - the zone from a depth of 24 to 42 inches (the Bt and BC horizons)

SIR=NC0075, NC0132 (WET SUBSTRATUM)
MLRA=133A, 153A, 153B
REVISED=2/6/96, MHC

TABULAR SERIES DATA:

```
SOI-5  Soil Name   Slope  Airtemp FrFr/Seas Precip  Elevation

SOI-5  FloodL FloodH Watertable Kind   Months  Bedrock Hardness

SOI-5  Depth  Texture                3-Inch  No-10  Clay%   -CEC-

SOI-5  Depth    -pH-     O.M.  Salin  Permeab   Shnk-Swll
```

National Cooperative Soil Survey
U.S.A.

Section h

Hydrogeologic & Geologic Information

KENTEC FACILITY

REGIONAL GEOLOGY

The DuPont Kentec site is located along the inner margin of the central coastal plain, about 25 miles southeast of the piedmont. The sediments of the North Carolina Coastal Plain are a wedge-shaped sequence of marine and non-marine rocks that dip and thicken to the southeast. Approximately 800 feet of sediments overlie crystalline bedrock in the area near the DuPont Kentec site (NCDNR&CR, 1985). These sediments are from Lower Cretaceous to Recent in age. The major sedimentary units that overlie the bedrock, from oldest to youngest, are: (1) the Cape Fear Formation, (2) the Black Creek Formation, (3) the Peedee Formation, and (4) surficial deposits. This study involves sediments from the upper part of the Peedee Formation and from the surficial deposits overlying the Peedee.

The Peedee Formation consists of dark green or gray, medium-to coarse-grained quartz sands interlayered and mixed with marine clays and silts. The sand beds are commonly gray or greenish gray and contain varying amounts of glauconite. The Peedee Formation is approximately 120 feet thick in the Kinston, North Carolina area. The surficial deposits consist of thin beds of sand and clay that may attain a thickness of 10 to 20 feet locally.

SITE GEOLOGY

Three distinct sedimentary units were encountered during drilling at the site. The uppermost unit consists of yellowish brown to yellowish orange, fine to very coars sand and silty sand. This unit is from 4 to 10 feet thick at the site. The unit tends to be finer-grained and more silty in the upper 3 feet and denser and coarser at its base; it contained

pebbles at and near its base in some boreholes. This uppermost unit is believed to correspond to the surficial deposits that overlie the Peedee Formation regionally.

Underlying these sands is a deposit of gray to greenish gray, stiff, clayey and sandy silts; there is a notable variation in the relative proportions of sand and clay from place to place in the unit. The deposit is flay lying, approximately 20 feet thick, and appears to be part of the upper portion of the Peedee Formation.

The clayey, sandy silt, mentioned above, is underlain by a deposit of loose, fine to medium, greenish-gray to dark gray, glauconitic sand with some interfingered sand and silt layers and fragments of calcareous sandstone and shells. The upper portion of this unit contains some stiff, clayey silts and clayey sands. This unit is also considered to be part of the Peedee Formaiton.

REGIONAL HYDROGEOLOGY

The regional hydrogeologic system of the North Carolina Coastal Plain in the area near Kentec comprises several aquifers within the geologic units discussed in the previous section. From shallowest to deepest, these are: (1) the surficial aquifer, (2) the Peedee aquifer, (3) the Black Creek aquifer, and (4) the Cape Fear aquifer. These aquifers are not co-extensive with the geologic units of the same name, however; they include only the more permeable zones within each unit. The aquifer of primary interest is the surficial aquifer. Based on laboratory analyses of Shelby Tube samples, the average linear velocity of downward flow through the clayey silt unit is estimated to range from 0.03 feet per year to 0.3 feet per year.

DuPont Kentec Plant
Kinston, NC

Physical Parameters of the Shallow and Deep Aquifers

Monitoring Well ID	Hydraulic Conductivity (K) (cm/sec)	Hydraulic Conductivity (K) (ft/day)	Transmissivity (T) (ft^2/day)	Specific Yield* (S_y) (No Units)
Shallow Aquifer	Slug Test (Rising Head)	Slug Test (Rising Head)		
MW-3	8×10^{-4}	2	8	0.01-0.30
MW-4	1×10^{-3}	3	19.5	0.01-0.30
MW-5	3×10^{-3}	9	63	0.01-0.30
MW-7	6×10^{-3}	20	40	0.01-0.30
MW-8	4×10^{-2}	100	100	0.01-0.30
MW-10	1×10^{-3}	3	27	0.01-0.30
MW-13	5×10^{-5}	0.1	0.4	0.01-0.30
MW-16	1×10^{-3}	3	15	0.01-0.30
Deep Aquifer				
MW-4B	1×10^{-2}	30	NA	NA
MW-7B	3×10^{-2}	90	NA	NA
MW-14B	1×10^{-3}	3	NA	NA

NA= Not Available
*= The specific yield of unconfined aquifers generally range from 0.01 to 0.30 (finer grained units have smaller values of specific yield). See Freeze and Cherry, 1979, Groundwater, p.61.
Note: Storage in aquifer appears to be stratigraphically controlled along bedding planes.

Physical Parameters of the Confining Unit
Results of Shelby Tube Analyses

Monitoring Well ID (Deep Well)	Depth of Sample (feet)	Elevation of Sample (feet above MSL)	Vertical Hydraulic Conductivity (feet/day)
MW-4B	17-19	11.4-13.4	0.1
MW-7B	11-13	14.8-16.8	0.1
MW-14B	15-17	8.3-10.3	0.0009

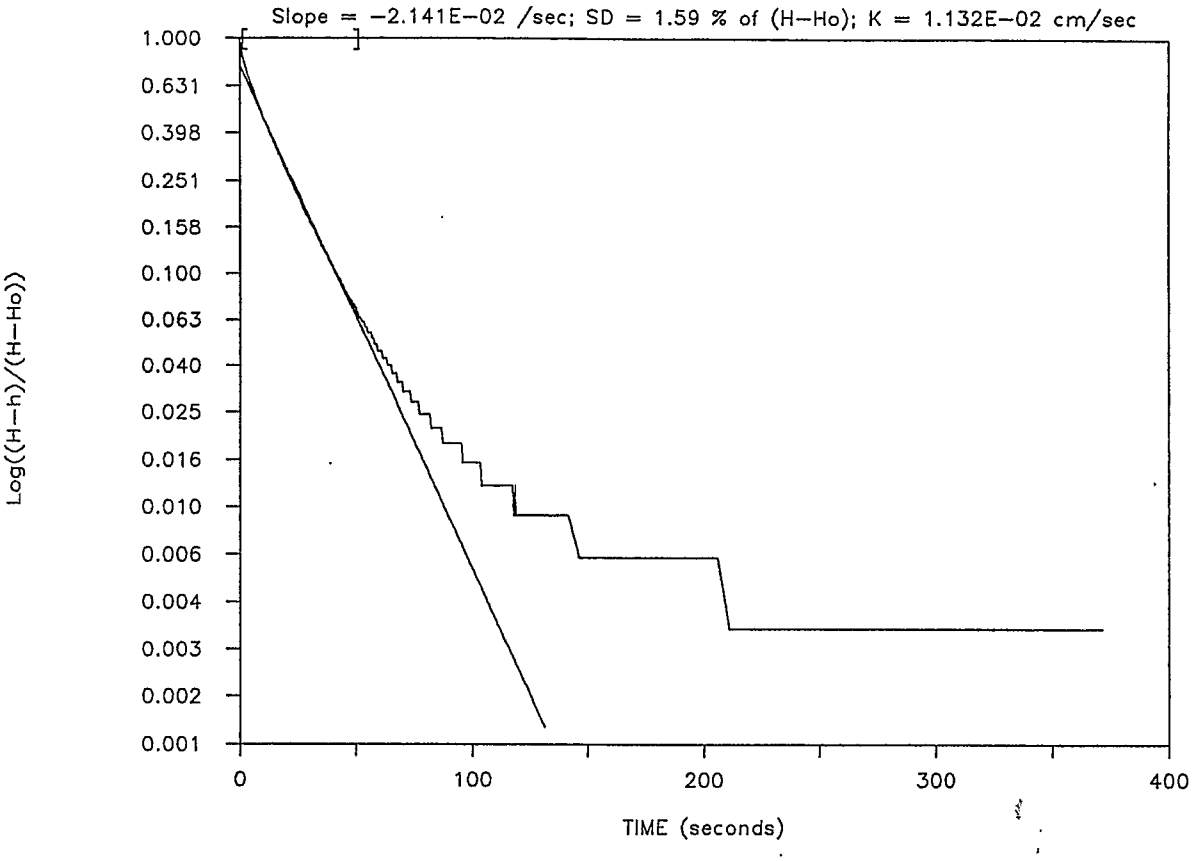
Table 3-4
VERTICAL GRADIENTS AT DU PONT KENTEC
FEBRUARY 1, 1990

Well Pair	Hydraulic Head in Shallow Well (ft MSL)	Elevation of Screened Zone of Shallow Well (ft MSL)	Hydraulic Head in Deep Well (ft MSL)	Elevation of Screened Zone of Deep Well (ft MSL)	Distance Between Screen Centers (ft)	Downward Gradient*
MW4A/B	27.08	15.6 to 25.6	22.14	-25.6 to -15.6	41.2	0.12
MW7A/B	24.09	17.9 to 22.9	22.13	-18.2 to -8.2	33.6	0.058
MW14A/B	22.40	17.4 to 21.9	21.83	-25.3 to -15.3	40.0	0.014

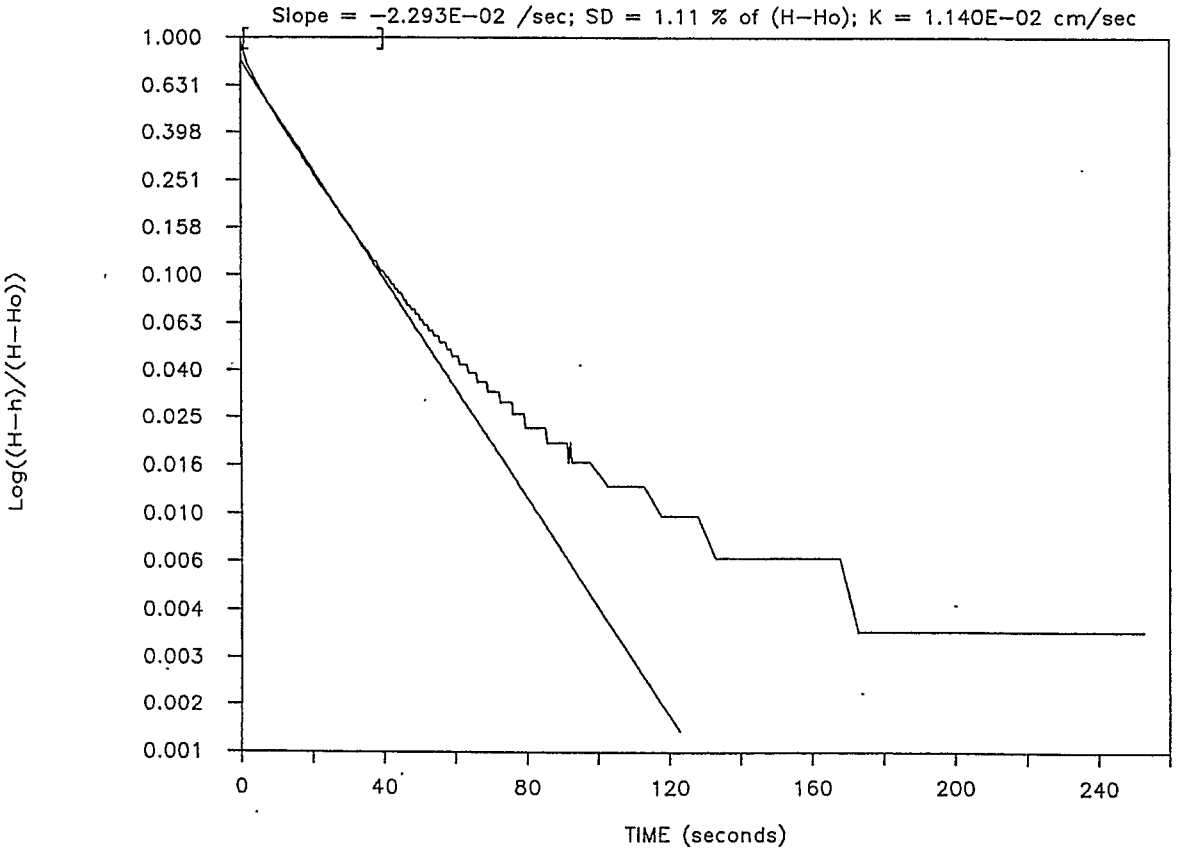
*Gradient measured between centers of screened intervals.

WDCR478/014.51

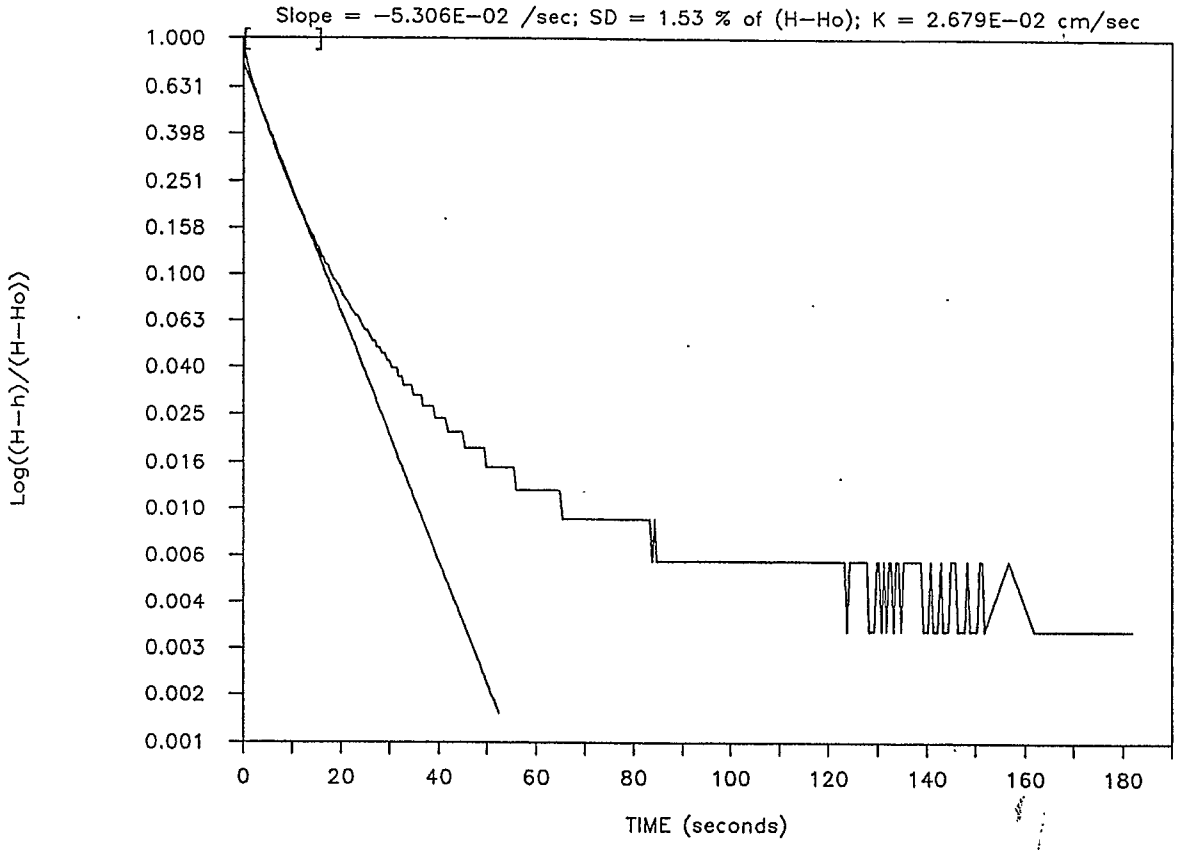
Aquifer Slug Test #1 (Rising Head) at MW-4B; 303 data points



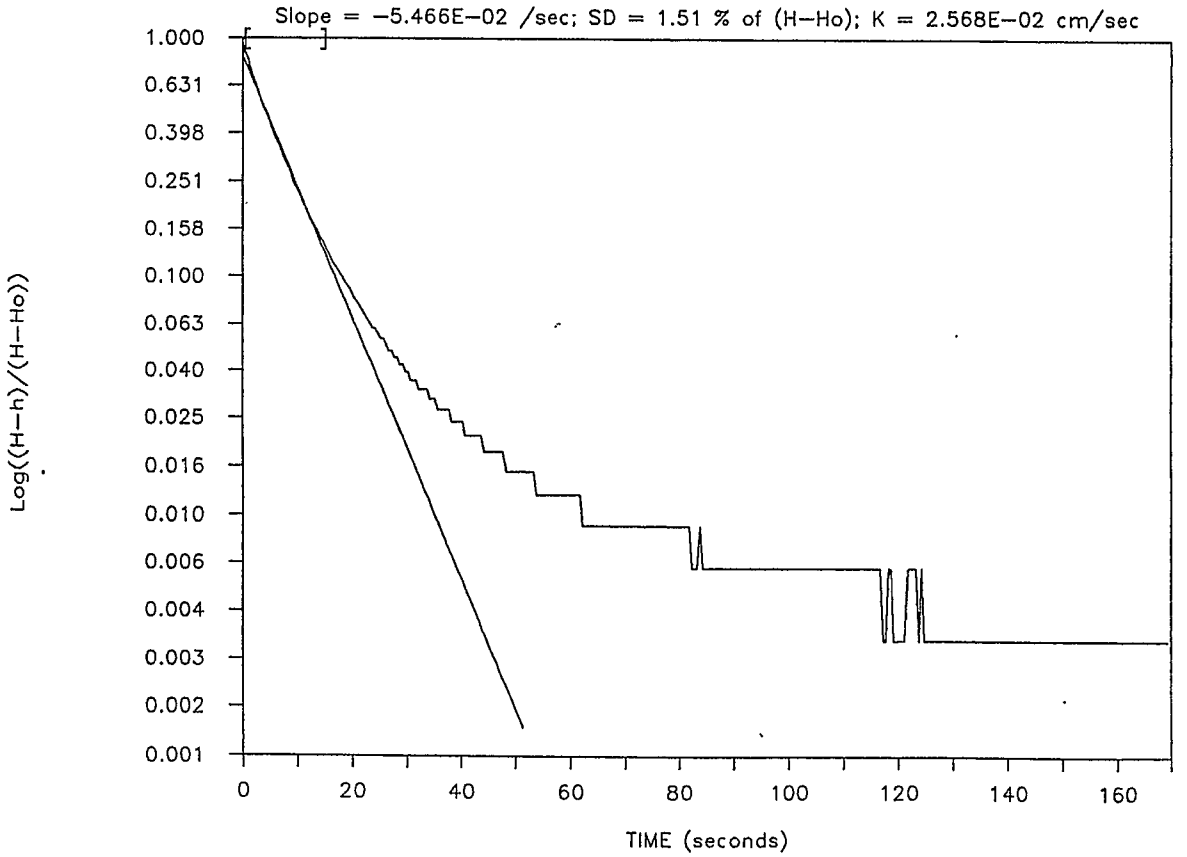
Aquifer Slug Test #2 (Rising Head) at MW-4B; 219 data points



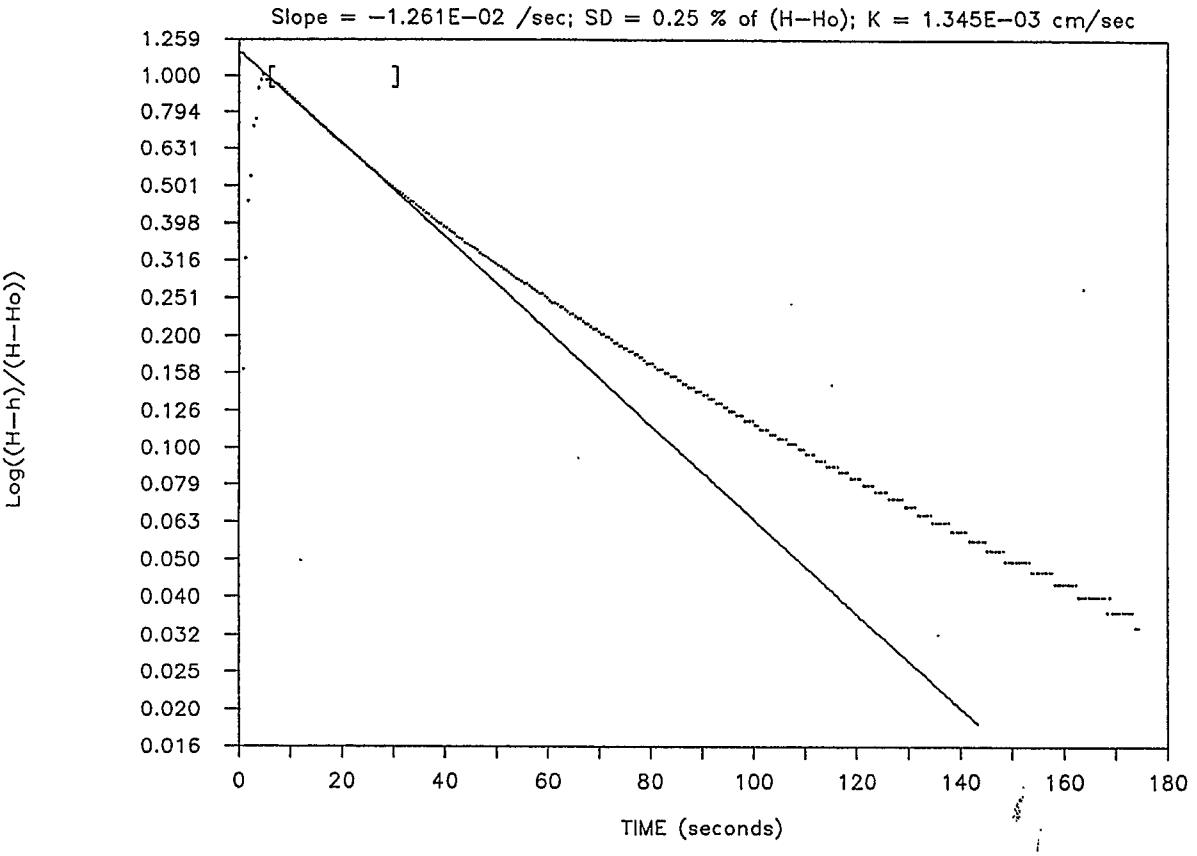
Aquifer Slug Test #1 (Rising Head) at MW-7B; 311 data points



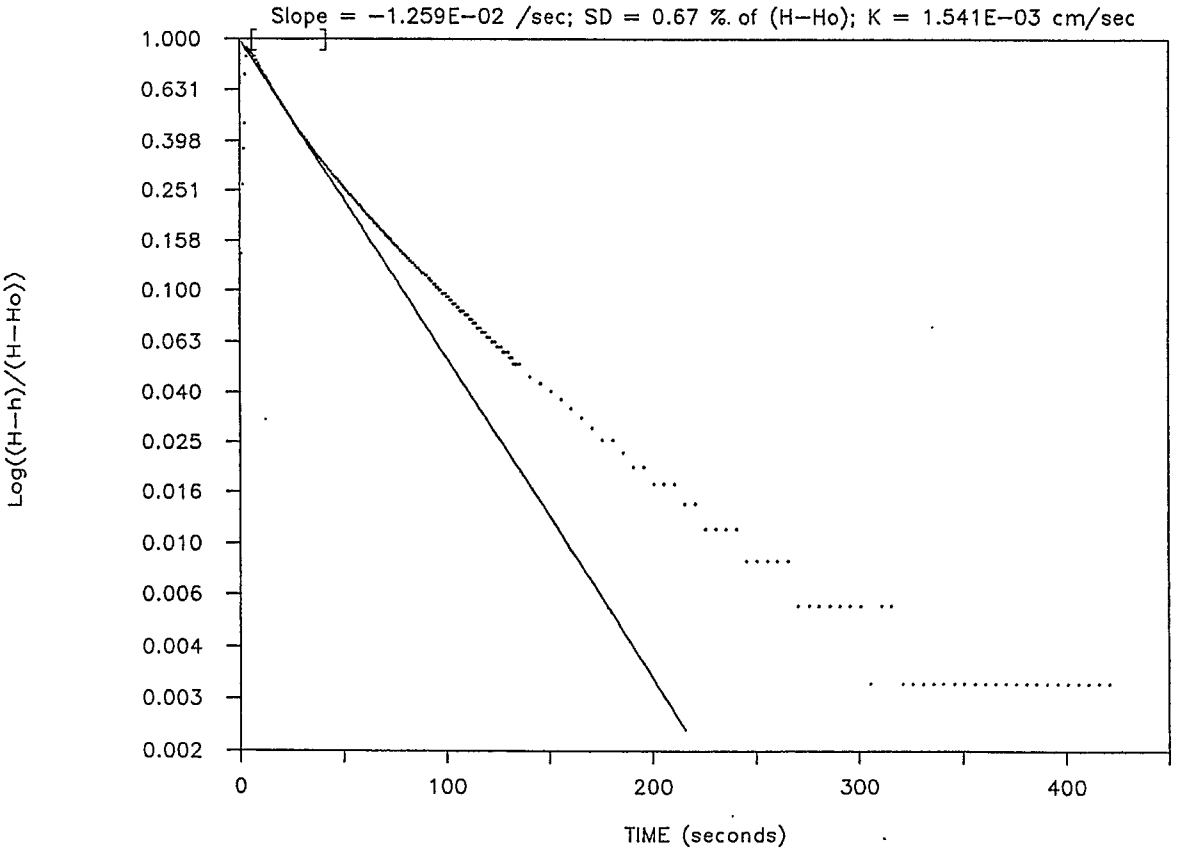
Aquifer Slug Test #2 (Rising Head) at MW-7B; 340 data points



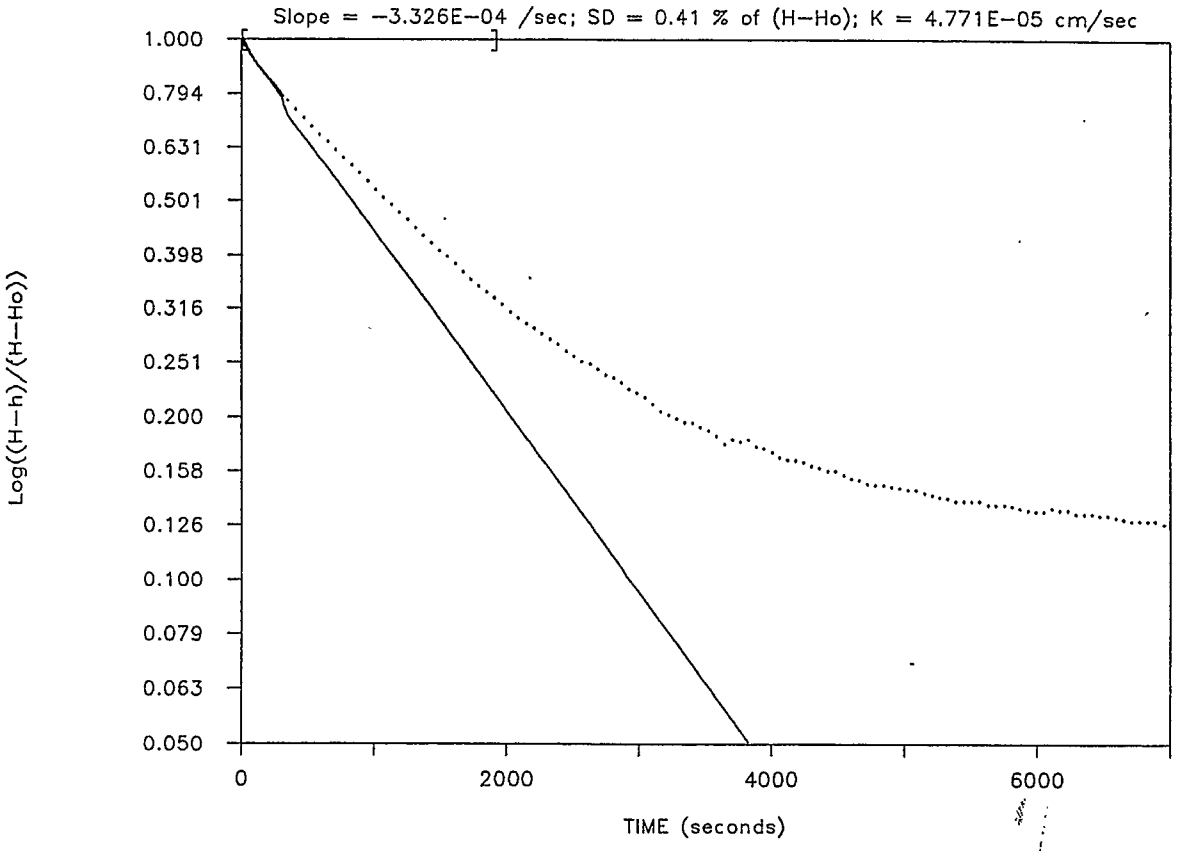
Aquifer Slug Test #1 (Falling Head) at MW-10; 350 data points



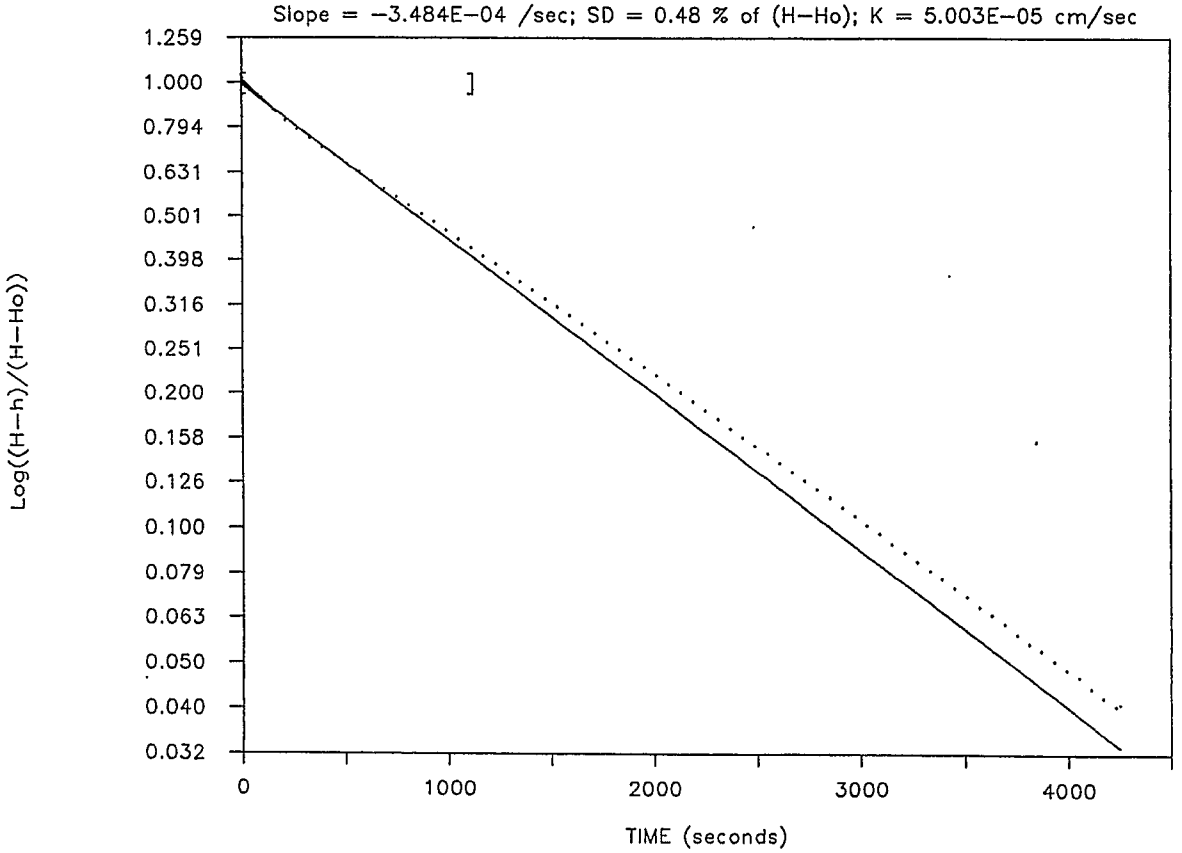
Aquifer Slug Test #2 (Falling Head) at MW-10; 350 data points



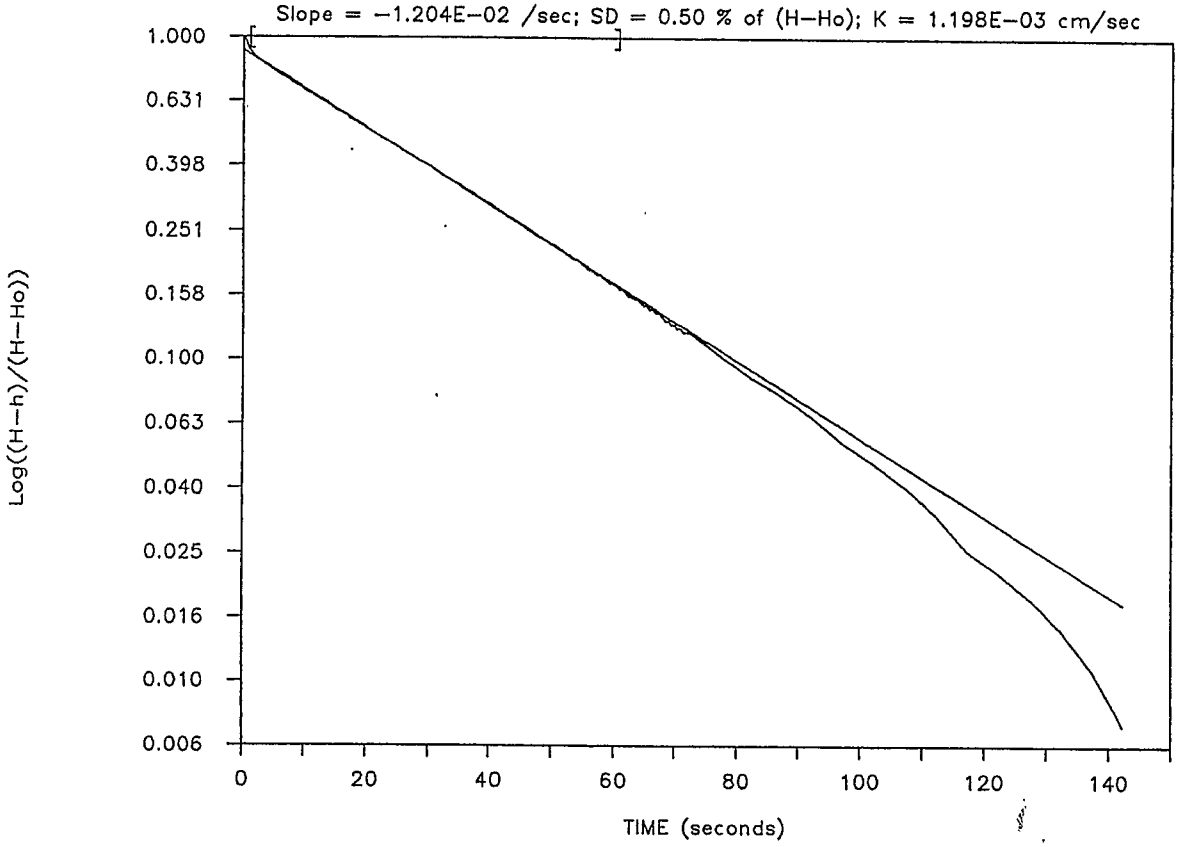
Aquifer Slug Test #1 (Falling Head) at MW-13; 287 data points



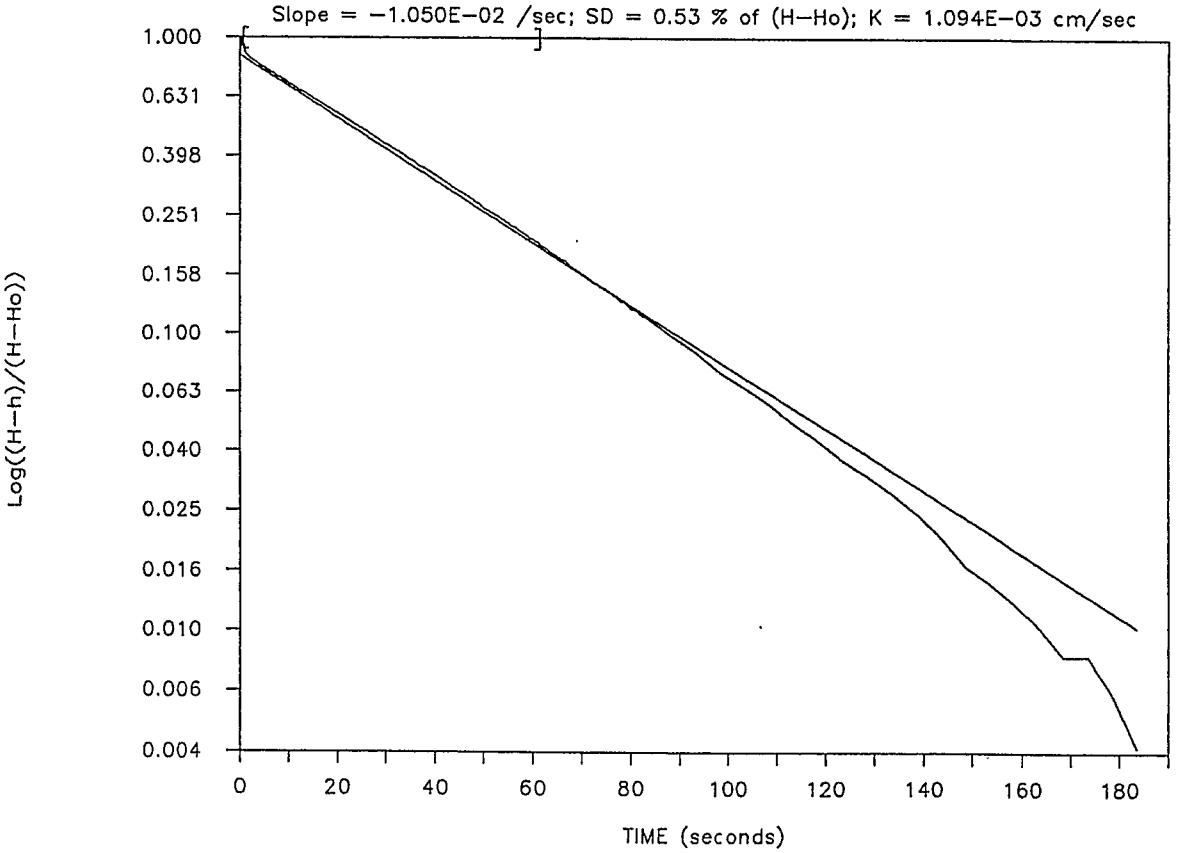
Aquifer Slug Test #2 (Falling Head) at MW-13; 139 data points



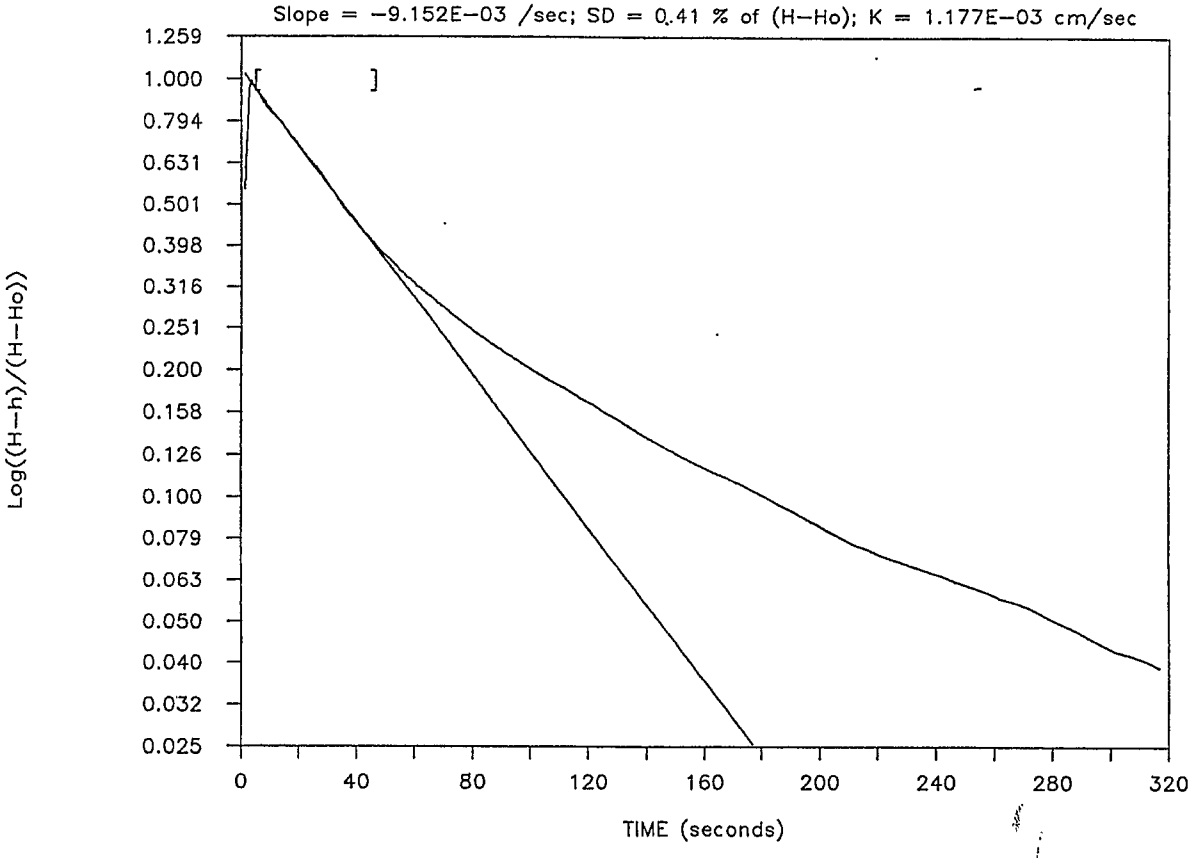
Aquifer Slug Test #1 (Rising Head) at MW-14B; 161 data points



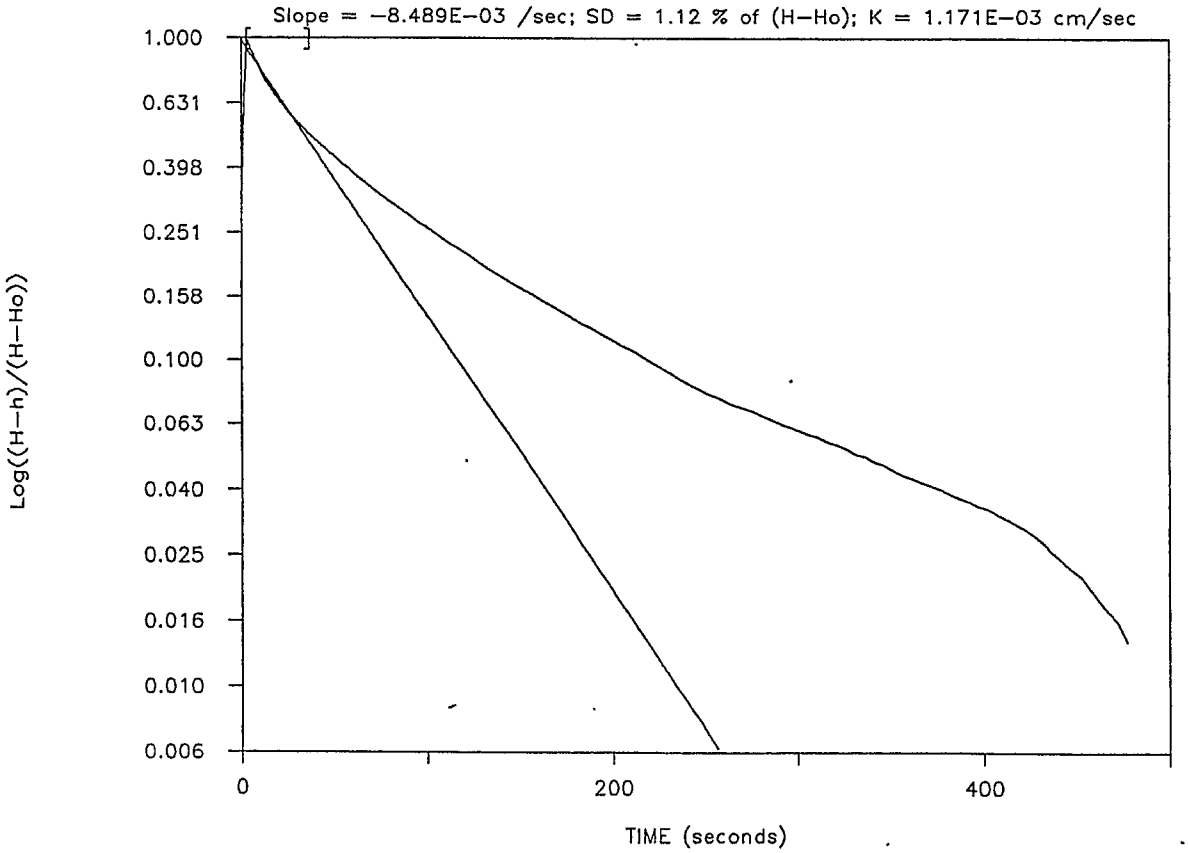
Aquifer Slug Test #2 (Rising Head) at MW-14B; 195 data points

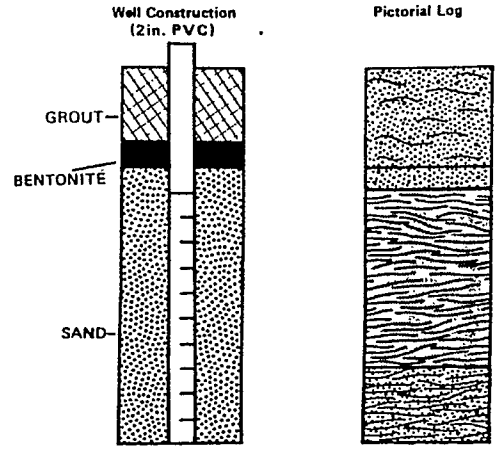


Aquifer Slug Test #1 (Falling Head) at MW-16; 242 data points



Aquifer Slug Test #2 (Falling Head) at MW-16; 281 data points

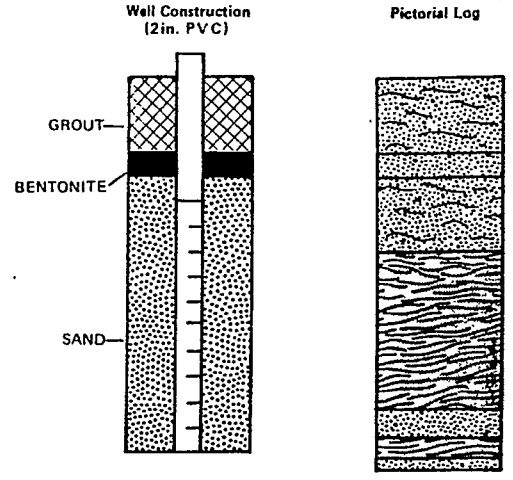




Sample Number	Interval (ft.)	Recovery (in.)	Blow Counts 6"–6"–6"–6"	Written Log	Elevation (ft.)
					29.0
S1	0–1.5	11	3–3· 4	Fine silty sand, dusky brown (5YR 2/2)– gray orange (10YR 7/4), moist.	
S2	3.5–5	18	7–9–11	M – c. sand, gray-orange (10YR 7/4), to fine sil y sand, green gray (5GY 4/1), wet.	24.0
S3	8.5–10	24	12–16–22	Clayey silt with trace sand, green-black (5G 2/1), dense, sl. plastic, moist.	19.0
S4	13.5–15	20	5–9–12	Sandy silt with trace clay, green black (5G 2/1), dense, v. sl. plastic, some glauconite, v. moist.	14.0
					9.0

WELL CONSTRUCTION AND GEOLOGIC LOG
MONITORING WELL 1
Du PONT – KENTEC·

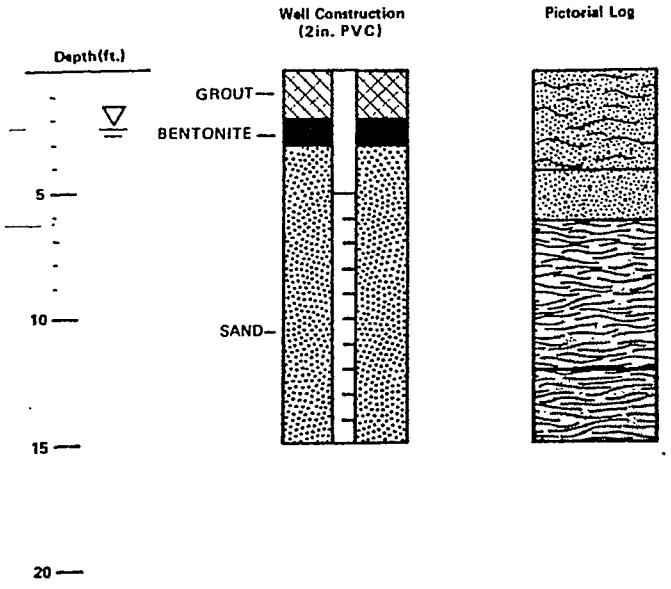
CH2M HILL



Sample Number	Interval (ft.)	Recovery (in.)	Blow Counts 6"–6"–6"–6"	Written Log	Elevation (ft.)
					30.0
S1	0–1.5	14	2–1–2	Fine sand with some silt, dusky yel. br. (10YR 2/2) gray orange (10YR 7/4) sl. moist.	
S2	3.5–5	15	2–5–8	Fine –m sand, trace silt, yel. orange (10YR 6/6), wet	
				Fine –m silty sand, trace clay, green gray (5G 2/1), sl. plastic, dense, v. moist.	25.0
S3	8.5–10	24	2–6–7	Clayey silt, trace sand, green-black (5G 2/1), sl. plastic, dense, v. moist.	20.0
S4	13.5–15	10	17–29–14	Fine –m. sand with some gravel, grey-green (5GY 4/1), wet.	
				Clayey sandy silt, green-black (5G 2/1), dense, sl. plastic, v. moist.	15.0
S5	14–15.5	24	6–14–15	M–c. sand, gray (N4), wet.	
					10.0

WELL CONSTRUCTION AND GEOLOGIC LOG
MONITORING WELL 2
Du PONT – KENTEC

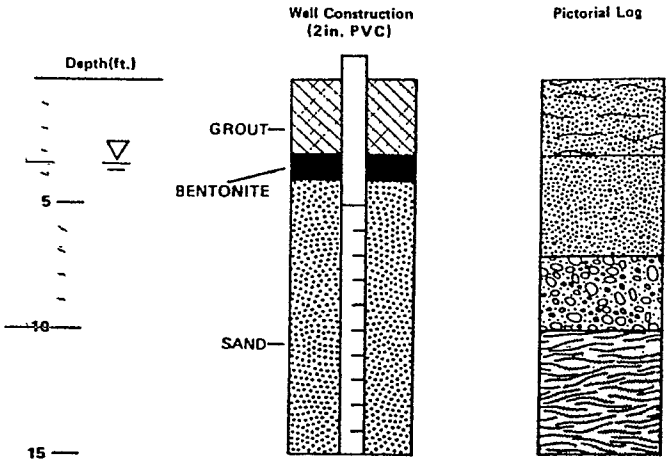
CH2MHILL



Sample Number	Interval (ft.)	Recovery (in.)	Blow Counts 6"–6"–6"–6"	Written Log	Elevation (ft.)
					29.5
				Fine silty sand, yellow orange (10YR 6/6) – gray orange (10YR 7/4) moist-wet.	
S1	3.5 5	17	5 8 9	Fine - c. sand, with some silt, color as above, wet.	24.5
S2	8.5--10	18	3–6–10	Clayey sandy silt, gray (N3), dense, sl. plastic, v. moist.	19.5
S3	13.5–15	18	7–12–12	As above, with more sand, with some glauconite, moist.	14.5
					9.5

WELL CONSTRUCTION AND GEOLOGIC LOG
MONITORING WELL 3
Du PONT – KENTEC

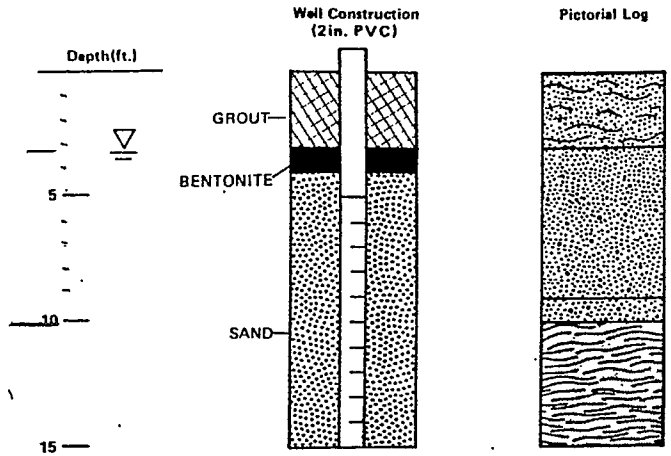
CRA HILL



Sample Number	Interval (ft.)	Recovery (in.)	Blow Counts 6"–6"–6"–6"	Written Log	Elevation (ft.)
					30.6
S1	0–1.5	18	3–2–2	Fine silty sand, yell. br. (10YR 4/2)–yell. orange (10YR 6/6), moist.	
S2	3.5–5	17	4–5–6	Fine–c. sand, trace silt, yell. orange (10YR 6/6), gray orange (10YR 7/4), wet.	25.6
S3	8.5–10	24	3–4–5	M–c. sand with some gravel, gray (N4–N5)–black ((N1), wet.	20.6
S4	13.5–15	24	8–10–14	Clayey silt with some sand, green black (5G 2/1)–gray (N4), dense, moist-wet.	15.6
					10.6

WELL CONSTRUCTION AND GEOLOGIC LOG
MONITORING WELL 4
Du PONT – KENTEC

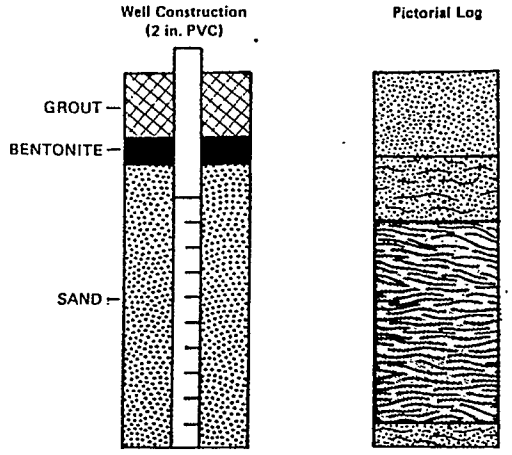
CH2MHILL



Sample Number	Interval (ft.)	Recovery (in.)	Blow Counts 6"–6"–6"–6"	Written Log	Elevation (ft.)
					30.6
S1	0–1.5	24	3–2–2	Fine silty sand, dusky yell. br. (10YR 4/2)–yell. orange (10YR 6/6), moist.	
S2	3.5–5	18	2–2–4		25.6
				M–c. sand, gray orange (10YR 7/4), wet.	
S3	8.5–10	24	2–3–4	As above but black (N1), wet.	20.6
				Clayey sandy silt, green black (5G 2/1), wet.	
S4	13.5–15	18	6–8–11		15.6
					10.6

WELL CONSTRUCTION AND GEOLOGIC LOG
MONITORING WELL 5
Du PONT – KENTEC

CH2MHILL

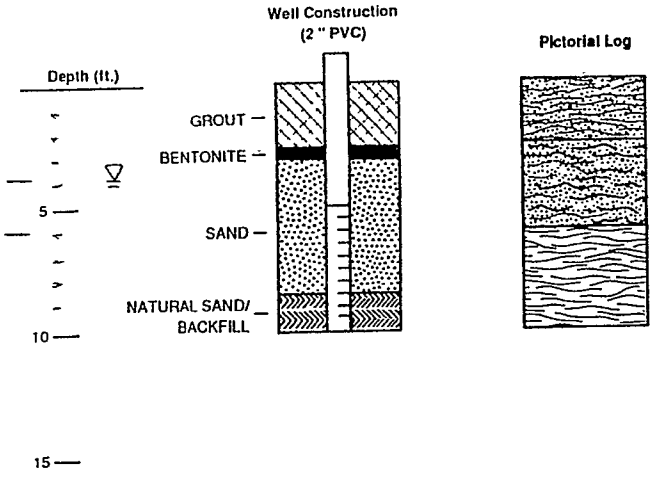


Sample Number	Interval (ft.)	Recovery (in.)	Blow Counts 6"–6"–6"–6"	Written Log	Elevation (ft.)
					28.5
				Fine–c. sand, gray orange (10YR 7/4) wet.	
S1	3.5–5	15	7–9–11	Fine–m. silty sand, gray green (5G 6/1), sl. cohesive, wet.	23.5
S2	8.5–10	20	7–10–14	Clayey sandy silt, green-black (5G 2/1), sl. plastic, dense, v. moist	18.5
S3	13.5–15	18	7–13–18	Silty sand, green black (5G 2/1), wet	13.5
					8.5

WELL CONSTRUCTION AND GEOLOGIC LOG
MONITORING WELL 6
Du PONT – KENTEC

CH2MHILL

SAT 22398 B0

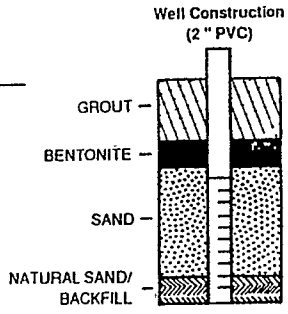


Sample Number	Interval (ft.)	Recovery (in.)	Blow Count 6"-6"-6"	Written Log	Elevation (ft.)
					27.9
				Top soil: clayey silty sand, light brown.	25.7
S1	3.5-5	17	6-11-11	Silty fine to medium sand with trace clay, brown (5 YR 3/2) to greenish gray (5 GY 6/1).	21.7
S2	8.5-10	24	11-9-14	Clayey silt, greenish black (5 GY 2/1), moist, sl. plastic.	

WELL CONSTRUCTION AND GEOLOGIC LOG
MONITORING WELL 7
Du PONT - KENTEC

CH2MHILL

SAT 22398 B0



Depth (ft.)	Sample Number	Interval (ft.)	Recovery (in.)	Blow Count 6"-6"-6"	Written Log	Elevation (ft.)
						29
5 ▽	S1	3.5-5	11	3-4-9	Silty c. sand, dark yellowish orange (10 YR 5/6), wet.	23
	S2	8.5-10	20	3-5-6	Silty clay with some fine sand, several thin c. sand seams, black (N1), moist, plastic.	
10						
15						

WELL CONSTRUCTION AND GEOLOGIC LOG
MONITORING WELL 8
Du PONT - KENTEC

CH2MHILL

PROJECT: DU PONT KENTEC FACILITY, GRIFTON, NORTH CAROLINA
DRILLER: WESTINGHOUSE ENVIRONMENTAL LOGGER: J. FORD
DRILLING METHOD/EQUIPMENT: MUD ROTARY / SPEEDSTAR
GROUND ELEVATION (FT MSL): 30.4 START DATE: 10/3/89 FINISH DATE: 10/5/89

BORING : MW-4B
PAGE 1 OF 2; 0 ft - 50 ft
CH2M HILL
PROJECT #:SAT 22398.CO

ELEVATION (FT MSL)	DEPTH (FEET)	SAMPLE COLLECTION DATA: INTERVAL (FEET)	SAMPLE NUMBER	RECOVERY (IN)	STANDARD PENETRATION TEST 6"-6"-6" (N)	WRITTEN LOG	SYMBOLIC LOG	WELL CONSTRUCTION 2 Inch PVC
25.4	5					NOTE: REFER TO THE MW-4 LOG IN THE PHASE 2 REPORT FOR SHALLOW LITHOLOGIES		
20.4	10							
15.4	15					6-INCH STEEL CASING TO 15' 2"		
10.4	20							
5.4	25	22-24	S-1	24	N/A	0-24": VERY FINE CLAYEY SILT, DARK GREENISH GRAY (5G 4/1), CLEAN, MOIST, NON-PLASTIC		GROUT
0.4	30	27-29	S-2	24	N/A	0-24": SAME AS S-1		
-4.6	35	32-34	S-3	24	N/A	0-24": SAME AS S-1		
-9.6	40	37-39	S-4	24	N/A	0-24": SAME AS S-1 WITH MORE BANDED SILT AND SAND LAYERS		BENT.
-14.6	45	42-44	S-5	24	N/A	0-24": SAME AS S-1		SAND
		47-49	S-6	24	N/A	0-21": VERY SANDY CLAY WITH SOME SILT,GRAYISH OLIVE GREEN (5GY3/2), MEDIUM TO COARSE SAND,WET , 21-24": FINE TO MEDIUM UNCONSOLIDATED SAND, DARK YELLOWISH GREEN (10GY3/2)		

PROJECT: DU PONT KENTEC FACILITY ; GRIFTON, NORTH CAROLINA
DRILLER: WESTINGHOUSE ENVIRONMENTAL LOGGER: J. FORD
DRILLING METHOD/EQUIPMENT: MUD ROTARY / SPEEDSTAR
GROUND ELEVATION (FT MSL): 30.4 START DATE: 10/3/89 FINISH DATE: 10/5/89

BORING : MW-4B

CH2M HILL
PROJECT #:SAT 22398.CO

ELEVATION (FT MSL)	DEPTH (FEET)	SAMPLE COLLECTION DATA: INTERVAL (FEET)	SAMPLE NUMBER	RECOVERY (IN)	STANDARD PENETRATION TEST 6"-6"-6"-6" (N)	WRITTEN LOG	SYMBOLIC LOG	WELL CONSTUCTION 2 Inch PVC
-24.6	55	52-54	S-7	24	N/A	0-24": FINE TO MEDIUM UNCONSOLIDATED SAND, DARK YELLOWISH GREEN (10GY 3/2)		SAND
						BORING TERMINATED AT 56.0 FEET		

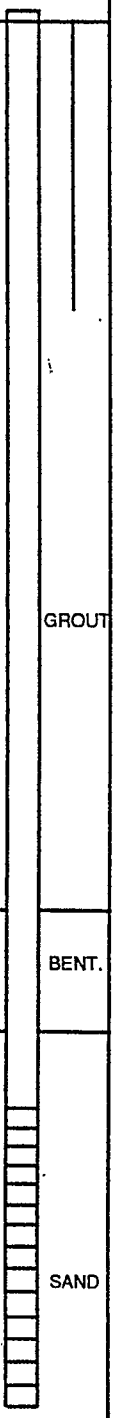
WELL SUMMARY

GROUT: 0 - 39.0 FT
BENTONITE: 39.0 - 43.0 FT
SAND: 43.0 - 56.0 FT
SCREEN: 46.0 - 56.0 FT

PROJECT: DU PONT KENTEC FACILITY; GRIFTON, NORTH CAROLINA
DRILLER: WESTINGHOUSE ENVIRONMENTAL LOGGER: J. FORD
DRILLING METHOD/EQUIPMENT: MUD ROTARY / SPEEDSTAR
GROUND ELEVATION (FT MSL): 27.8 START DATE: 10/3/89 FINISH DATE: 10/9/89

BORING : MW-7B
PAGE 1 OF 2; 0 ft - 50 ft
CH2M HILL
PROJECT #:SAT 22398.C0.02

ELEVATION (FT MSL)	DEPTH (FEET)	SAMPLE COLLECTION DATA: INTERVAL (FEET)	SAMPLE NUMBER	RECOVERY (IN)	STANDARD PENETRATION TEST 6"-6"-6"-6" (N)	WRITTEN LOG	SYMBOLIC LOG	WELL CONSTUCTION 2 Inch PVC
22.8	5					NOTE: REFER TO THE MW-7 LOG IN THE PHASE 2 REPORT FOR SHALLOW LITHOLOGIES		
17.8	10					6-INCH STEEL CASING TO 9' 9"		
12.8	15							
		16-18	S-1	24	N/A	0-24":CLAYEY SILT WITH FINE SAND, GREENISH BLACK (5G 2/1), MOIST , SEMI-PLASTIC		
7.8	20							GROUT
		21-23	S-2	24	N/A	0-24":SAME AS S-1		
2.8	25							
		26-28	S-3	24	N/A	0-24":SAME AS S-1		
-2.2	30							BENT.
		31-33	S-4	24	N/A	0-24":SAME AS S-1		
-7.2	35							
		36-38	S-5	24	N/A	0-24":SAME AS S-1		
-12.2	40							SAND
		41-43	S-6	24	N/A	0-24": VERY CLAYEY SAND WITH SOME SILT, GRAYISH OLIVE GREEN (5GY 3/2), WET,COARSE GRAINED		
-17.2	45							
		46-48	S-7	22	N/A	0-24":FINE TO MEDIUM UNCONSOLIDATED SANDS, DARK YELLOWISH GREEN (10GY 3/2)		
						BORING TERMINATED AT 48.0 FEET WELL SUMMARY: GROUT: 0 - 29.5 FT; BENTONITE: 29.5 - 33.5 FT; SAND: 33.5 - 46.0 FT; SCREEN: 36.0 - 46.0 FT		



PROJECT: KENTEC FACILITY ; GRIFTON, NORTH CAROLINA
DRILLER: WESTINGHOUSE ENVIRONMENTAL LOGGER: STEVEN BROWN
DRILLING METHOD/EQUIPMENT: CME-55 WITH 6 1/4" HSA
GROUND ELEVATION (FT MSL): 30.6 START DATE: 10/4/89 FINISH DATE: 10/5/89

BORING : MW-10
PAGE 1 OF 1
CH2M HILL
PROJECT #:SAT 22398.C0

ELEVATION (FT MSL)	DEPTH (FEET)	SAMPLE COLLECTION DATA: INTERVAL (FEET)	SAMPLE NUMBER	RECOVERY (IN)	STANDARD PENETRATION TEST 6"-6"-6"-6" (N)	WRITTEN LOG	SYMBOLIC LOG	WELL CONSTUCTION 2 Inch PVC
25.6	5	4 - 5.5	S1	22	7-9-10	0-22": MED. TO C. BEACH SAND WITH SOME SILT, DARK YELLOWISH ORANGE (10 YR 6/6), WET, MODERATELY LOOSE		GROUT / BENTONITE
20.6	10	8.5-10	S2	18	5-5-5	0-10": MED. SAND TO F. PEBBLES, MODERATE YELLOWISH BROWN (10 YR 5/4), WET, LOOSE; 10-18": SILTY SANDY CLAY, GRAYISH OLIVE (10 Y 4/2), WET, STIFF		SAND
15.6	15	13.5-15	S3	20	20-40-45	0-3": SILTY CLAYEY F. TO C. SAND, DARK YELLOWISH ORANGE (10 YR 6/6), MOIST, STIFF; 3-20": CLAYEY SILTY F. TO C. SAND, DARK GRAY (N3), MOIST, V. STIFF		

BORING TERMINATED AT 14 FEET

NOTE: STRONG ODOR DETECTED DURING DRILLING BUT NO MONITORING DETECTIONS

WELL SUMMARY

GROUT: 0 TO 3'
BENTONITE:3' T0 5' 3"
SAND: 5'3" TO 12' 6"
SCREEN: 6' TO 12' 6"

PROJECT NUMBER:SAT22398.D0 | BORING NO.: MW10B | SHEET: 1 OF 3

CH2M HILL

SOIL BORING LOG

PROJECT: DUPONT KENTEC | LOCATION:LENOIR CO., NC

ELEVATION:~30' | DRILLING CONTRACTOR: HARDIN-HUBER INC.

DRILLING METHOD AND EQUIPMENT: 8" HSA & 6" ROTARY W/A FAILING F-7

WATER LEVEL AND DATE: ~8', 7/30/90 | START: 7/30/90 | FINISH: 8/1/90 | LOGGER: A. BRYDA

DEPTH BELOW SURFACE	DEPTH INTERVAL	TYPE AND NUMBER	REC	STD. PEN. TEST 6"-6"-6" (N)	SOIL DESCRIPTION: SOIL NAME, COLOR, MOISTURE CONTENT, RELATIVE DENSITY OR CONSISTENCY, SOIL STRUCTURE, MINERALOGY, USCS GROUP SYMBOL	SYMBOL	COMMENTS: DEPTH OF CASING, DRILLING RATE, DRILLING FLUID LOSS, TEST AND INSTRUMENTATION
							AIR MONITORING (AM): OVA AND EXPLOSIMETER. WILL NOTE ANY ABOVE BACKGROUND READINGS
							DRILLING NEXT TO MW10 SEE MW10 BORING LOG FOR SOIL DESCRIPTION
5							
10	10-12	S1	1.7	2-2-2-3 (4)	0-3" SILTY SAND, (SC), SAND IS F-M, GRAYISH ORANGE (10YR7/4), WET, VERY LOOSE 3-12" SILT W/ SAND, (ML), SAND IS F., VERY PALE ORANGE TO DARK YELLOW ORANGE (10YR6/6), WET, VERY LOOSE 12-20" SILT W/ SAND, (ML), SAND IS C. W/ SOME CLAY, MOIST, VERY LOOSE		SILT LAYER AT ~11' AM: >100 PPM, 0.
							SET 6" ID CASING +1 TO 13'
							SUCCESSFUL PRESSURE TEST OF CASING ON 7/31/90
15	15-17	S2	1.8	15-13--10-13 (23)	0-6" SILTY SAND, (SC), SAND IS M-VC, OLIVE GRAY (5Y3/2), WET, MEDIUM TO DENSE, SOME SHELLS 6-20" SILT W/ SAND, (ML), SAND IS M, OLIVE GRAY (5Y3/2), WET, V. STIFF		
20							

SBLSYM 06/14/88

PROJECT NUMBER:SAT22398.DO | BORING NO.: MW10B | SHEET: 2 OF 3

CH2M HILL

SOIL BORING LOG

PROJECT: DUPONT KENTEC | LOCATION:LENOIR CO., NC

ELEVATION:~30' | DRILLING CONTRACTOR: HARDIN-HUBER INC.

DRILLING METHOD AND EQUIPMENT: 8" HSA & 6" ROTARY W/A FAILING F-7

WATER LEVEL AND DATE: ~8', 7/30/90 | START: 7/30/90 | FINISH: 8/1/90 | LOGGER: A. BRYDA

DEPTH BELOW SURFACE	DEPTH INTERVAL	TYPE AND NUMBER	REC	STD. PEN. TEST 6"-6"-6" (N)	SOIL DESCRIPTION: SOIL NAME, COLOR, MOISTURE CONTENT, RELATIVE DENSITY OR CONSISTENCY, SOIL STRUCTURE, MINERALOGY, USCS GROUP SYMBOL	SY MB OL	COMMENTS: DEPTH OF CASING, DRILLING RATE, DRILLING FLUID LOSS, TEST AND INSTRUMENTATION
20	20-22	S3	2.0	7-8--10-11 (18)	SILT, (ML), OLIVE GRAY (5Y3/2), WET, V. STIFF		
25	25-27	S4	1.4	7-12-20-30 (32)	SIMILAR TO S3 W/ SEVERAL THIN CLAY SEAMS AND SILTY SAND SEAMS, MICACEOUS		
30	30-32	S5	2.0	8-10--12-18 (22)	SIMILAR TO S3, SILT, (ML), OLIVE GRAY (5Y3/2), WET, V. STIFF, SOME CLAY AND F. SAND SEAMS		
35	35-37	S6	2.0	8-10--12-18 (22)	SIMIALR TO S5 ABOVE, SILT, MOIST W/ SEVERAL THIN SILTY F. SAND SEAMS		
40							

PROJECT NUMBER:SAT22398.D0 | BORING NO.: MW10B | SHEET: 3 OF 3

CH2M HILL

SOIL BORING LOG

PROJECT: DUPONT KENTEC | LOCATION:LENOIR CO., NC

ELEVATION:-30' | DRILLING CONTRACTOR: HARDIN-HUBER INC.

DRILLING METHOD AND EQUIPMENT: 8" HSA & 6" ROTARY W/A FAILING F-7

WATER LEVEL AND DATE: -8', 7/30/90 | START: 7/30/90 | FINISH: 8/1/90 | LOGGER: A. BRYDA

DEPTH BELOW SURFACE	DEPTH INTERVAL	TYPE AND NUMBER	R E C	STD. PEN. TEST 6"-6"-6" (N)	SOIL DESCRIPTION: SOIL NAME, COLOR, MOISTURE CONTENT, RELATIVE DENSITY OR CONSISTENCY, SOIL STRUCTURE, MINERALOGY, USCS GROUP SYMBOL	SOIL DESCRIPTION: SOIL GROUP SYMBOL	COMMENTS: DEPTH OF CASING, DRILLING RATE, DRILLING FLUID LOSS, TEST AND INSTRUMENTATION
	40-42	S7	2.0	10-12- -7-26 (19)	SIMILAR TO ABOVE, SILT W/ SEVERAL THIN SILTY F. SAND SEAMS		
45	45-47	S8	2.0	8-14- -21-40 (35)	SILTY CLAYEY SAND, (SC-SM), SAND IS M-C., OLIVE GRAY (5Y3/2), WET, DENSE, SOME SHELLS PRESENT		
50	50-52	S9	1.3	21-36- -50-23 (86)	SILTY SAND, (SM), SAND IS M-C., OLIVE GRAY (5Y3/2), WET, DENSE		BLOW COUNTS INDICATE "DENSE" SEDIMENTS, BUT THE SAND IS "LOOSE"
55	55-57	S10	1.7	24-60- -70-100/ (130)	SAME AS S9, SOME SHELLS		WELL CONSTRUCTION INFO 57' TOTAL DEPTH +1-13' 6" STEEL CASING 45-55' 2-INCH SCH 40 PVC, 10 SLOT SCREEN 55-57' NATURAL SAND PACK 42.6-55' #2 MORIE SAND PACK 36.5-42.6' BENTONITE PELLETS SEAL 0-36.5' PORTLAND TYPE I CEMENT GROUT
60							

SBLSYM 06/14/88

PROJECT NUMBER: ATL22398.F0 | BORING NO.: MW10C | SHEET: 1 of 6

CH2M HILL

SOIL BORING LOG

PROJECT: DUPONT KENTEC | LOCATION: LENOIR CO., NC

ELEVATION: ~32 FT MSL | DRILLING CONTRACTOR: HARDIN-HUBER INC.

DRILLING METHOD AND EQUIPMENT: 12" AND 8" MUD ROTARY W/A FAILING F-7

WATER LEVEL AND DATE: 12.2' on 2/21/91 START: 1/23/91 FINISH: 1/31/91 LOGGER: A. BRYDA

DEPTH BELOW SURFACE	DEPTH INTERVAL	TYPE AND NUMBER	R E C	STD. PEN. TEST 6"-6"-6" (N)	SOIL DESCRIPTION: SOIL NAME, COLOR, MOISTURE CONTENT, RELATIVE DENSITY OR CONSISTENCY, SOIL STRUCTURE, MINERALOGY, USCS GROUP SYMBOL	SY MB OL	COMMENTS: DEPTH OF CASING, DRILLING RATE, DRILLING FLUID LOSS, TEST AND INSTRUMENTATION
					FOR SOIL DESCRIPTION FROM 0-10' SEE BORING LOG MW10A. FOR SOIL DESCRIPTION FROM 15-60' SEE BORING LOG MW10B.		AIR MONITORING (AM): HNU AND EXPLOSIMETER. READINGS ARE BACKGROUND OF THE SPLIT SPOON AND THE BREATHING ZONE UNLESS OTHERWISE NOTED.
5							
10							
	13-15	S1	1.5	6-8-8-14 (16)	SILT W/ SAND, ML, MEDIUM DARK GRAY (N4), STIFF TO V. STIFF, DRY, SAND IS M-VC.		TOP OF THE SILT LAYER IS AT 13' AS DETERMINED BY THE COLOR CHANGE OF THE DRILLING MUD. SET 15' OF 8" STEEL CASING FROM 0-15' (2' INTO THE SILT LAYER). NOTE: ON 1/24 A HYDROSTATIC PRESSURE TEST WAS CONDUCTED ON THE 8" CASING.
15							
20							RIG CHATTER FROM 17 TO 17.5'.

CH2M HILL	PROJECT NUMBER: ATL22398.F0	BORING NO.: MW10C SHEET: 2 of 6

SOIL BORING LOG

PROJECT: DUPONT KENTEC LOCATION: LENOIR CO., NC
ELEVATION: ~32 FT MSL DRILLING CONTRACTOR: HARDIN-HUBER INC.
DRILLING METHOD AND EQUIPMENT: 12" AND 8" MUD ROTARY W/A FAILING F-7
WATER LEVEL AND DATE: 12.2' on 2/21/91 START: 1/23/91 FINISH: 1/31/91 LOGGER: A. BRYDA

DEPTH BELOW SURFACE	DEPTH INTERVAL	TYPE AND NUMBER	R E C	STD. PEN. TEST 6"-6"-6" (N)	SOIL DESCRIPTION: SOIL NAME, COLOR, MOISTURE CONTENT, RELATIVE DENSITY OR CONSISTENCY, SOIL STRUCTURE, MINERALOGY, USCS GROUP SYMBOL	SOIL BORING LOG: SAMPLE / LOG	COMMENTS: DEPTH OF CASING, DRILLING RATE, DRILLING FLUID LOSS, TEST AND INSTRUMENTATION
25	25-27	SH-1	1.0	-			
30							
35							
40							

CH2M HILL

PROJECT NUMBER: ATL22398.F0 | BORING NO.: MW10C | SHEET: 3 of 6

SOIL BORING LOG

PROJECT: DUPONT KENTEC | LOCATION: LENOIR CO., NC

ELEVATION: ~32 FT MSL | DRILLING CONTRACTOR: HARDIN-HUBER INC.

DRILLING METHOD AND EQUIPMENT: 12" AND 8" MUD ROTARY W/A FAILING F-7

WATER LEVEL AND DATE: 12.2' on 2/21/91 START: 1/23/91 FINISH: 1/31/91 LOGGER: A. BRYDA

DEPTH BELOW SURFACE	DEPTH INTERVAL	TYPE AND NUMBER	R E C	STD. PEN. TEST 6"-6"-6" (N)	SOIL DESCRIPTION: SOIL NAME, COLOR, MOISTURE CONTENT, RELATIVE DENSITY OR CONSISTENCY, SOIL STRUCTURE, MINERALOGY, USCS GROUP SYMBOL	SY MB OL L	COMMENTS: DEPTH OF CASING, DRILLING RATE, DRILLING FLUID LOSS, TEST AND INSTRUMENTATION
45							
50							
55							
60							

PROJECT NUMBER:ATL22398.F0 | BORING NO.: MW10C | SHEET: 4 of 6

CH2M HILL

SOIL BORING LOG

PROJECT: DUPONT KENTEC | LOCATION: LENOIR CO., NC

ELEVATION: ~32 FT MSL | DRILLING CONTRACTOR: HARDIN-HUBER INC.

DRILLING METHOD AND EQUIPMENT: 12" AND 8" MUD ROTARY W/A FAILING F-7

WATER LEVEL AND DATE: 12.2' on 2/21/91 START: 1/23/91 FINISH: 1/31/91 LOGGER: A. BRYDA

DEPTH BELOW SURFACE	DEPTH INTERVAL	TYPE AND NUMBER	R E C	STD. PEN. TEST 6"-6"-6" (N)	SOIL DESCRIPTION: SOIL NAME, COLOR, MOISTURE CONTENT, RELATIVE DENSITY OR CONSISTENCY, SOIL STRUCTURE, MINERALOGY, USCS GROUP SYMBOL	SY MBOL	COMMENTS: DEPTH OF CASING, DRILLING RATE, DRILLING FLUID LOSS, TEST AND INSTRUMENTATION
	60-62	S2	1.0	29-28-32 100/5" (60)	WELL GRADED SAND, SW, DUSKY YELLOW GREEN (10GY3/2), MOIST, SAND IS M-C., GLAUCONITIC, SUBROUNDED TO ROUNDED		DRILLER NOTES HARDER DRILLING BETWEEN 55 AND 60'. DRILLING MUD BECAME THICKER. PROBABLY A CLAY LAYER BETWEEN 55 AND 60'.
65	65-67	S3	1.2	20-40-50 -50/5" (90)	SAME AS S2, WET		
70	70-72	S4	0.8	29-100/6	SAME		DRILLER THINS THE MUD.
75	75-77	S5	0.8	100/6'	SAME		
80							

SBLSYM 06/14/88

PROJECT NUMBER: ATL22398.F0 | BORING NO.: MW10C | SHEET: 5 of 6

CH2M HILL

SOIL BORING LOG

PROJECT: DUPONT KENTEC | LOCATION: LENOIR CO., NC

ELEVATION: ~32 FT MSL | DRILLING CONTRACTOR: HARDIN-HUBER INC.

DRILLING METHOD AND EQUIPMENT: 12" AND 8" MUD ROTARY W/A FAILING F-7

WATER LEVEL AND DATE: 12.2' on 2/21/91 START: 1/23/91 FINISH: 1/31/91 LOGGER: A. BRYDA

DEPTH BELOW SURFACE	DEPTH INTERVAL	TYPE AND NUMBER	RECOVERY	STD. PEN. TEST 6"-6"-6" (N)	SOIL DESCRIPTION: SOIL NAME, COLOR, MOISTURE CONTENT, RELATIVE DENSITY OR CONSISTENCY, SOIL STRUCTURE, MINERALOGY, USCS GROUP SYMBOL	SYMBOL	COMMENTS: DEPTH OF CASING, DRILLING RATE, DRILLING FLUID LOSS, TEST AND INSTRUMENTATION
	80-82	S6	1.2	24-84- -50/2"	SIMILAR TO ABOVE W/ SLIGHTLY HIGHER CLAY CONTENT		
85	85-87	S7	1.0	44-40- -50/3"	SIMILAR TO ABOVE W/ SLIGHTLY HIGHER CLAY CONTENT AND SHELLS		
90	90-92	S8	0	100/5"	NO RECOVERY		RIG CHATTER 90-92' PROBABLY IN THE GRAVEL LAYER.
95	95-97	S9	0.4	72-100/2	WELL GRADED SAND, SW, OLIVE GRAY (5Y3/2), WET, SAND IS M-C.		SOME "TRASH" IN THE SPOON OF GRAVEL AND SHELLS, PROBABLY FROM THE GRAVEL LAYER.
100							

CH2M HILL

PROJECT NUMBER: ATL22398.F0 | BORING NO.: MW10C | SHEET: 6 of 6

SOIL BORING LOG

PROJECT: DUPONT KENTEC | LOCATION: LENOIR CO., NC

ELEVATION: ~32 FT MSL | DRILLING CONTRACTOR: HARDIN-HUBER INC.

DRILLING METHOD AND EQUIPMENT: 12" AND 8" MUD ROTARY W/A FAILING F-7

WATER LEVEL AND DATE: 12.2' on 2/21/91 START: 1/23/91 FINISH: 1/31/91 LOGGER: A. BRYDA

DEPTH BELOW SURFACE	DEPTH INTERVAL	TYPE AND NUMBER	R E C	STD. PEN. TEST 6"-6"-6" (N)	SOIL DESCRIPTION: SOIL NAME, COLOR, MOISTURE CONTENT, RELATIVE DENSITY OR CONSISTENCY, SOIL STRUCTURE, MINERALOGY, USCS GROUP SYMBOL	SAMPLE	LOG	COMMENTS: DEPTH OF CASING, DRILLING RATE, DRILLING FLUID LOSS, TEST AND INSTRUMENTATION
	100-102	S10	1.0	32-100/6	SAME AS S9			WELL CONSTRUCTION INFO
								102' TOTAL DEPTH
								0-15' 8" SURFACE CASING
								83-93' 20 SLOT 4" SCH 40
								PVC SCREEN
								91.5-93' NATURAL PACK
								79-91.5' #1 MORIE SAND
105								PACK (4-100 LBS BAGS)
								72-79' BENTONITE SLURRY
								0-72' CEMENT GROUT

PROJECT: KENTEC FACILITY ; GRIFTON, NORTH CAROLINA
DRILLER: WESTINGHOUSE ENVIRONMENTAL LOGGER: STEVEN BROWN
DRILLING METHOD/EQUIPMENT: CME-55 WITH 6 1/4" HSA
GROUND ELEVATION (FT MSL): 30.1 START DATE: 10/5/89 FINISH DATE: 10/5/89

BORING : MW-11
PAGE 1 OF 1
CH2M HILL
PROJECT #:SAT 22398.C0

ELEVATION (FT MSL)	DEPTH (FEET)	SAMPLE COLLECTION DATA: INTERVAL (FEET)	SAMPLE NUMBER	RECOVERY (IN)	STANDARD PENETRATION TEST 6"-6"-6"-6" (N)	WRITTEN LOG	SYMBOLIC LOG	WELL CONSTUCTION 2 Inch PVC
25.1	5	3.5-5'	S1	18	5-8-9	0-18": MED. TO C. BEACH SAND WITH VF. TO F. PEBBLES, PALE YELLOWISH BROWN (10 YR 6/2), LOOSE, WET		GROUT / BENTONITE / SAND
20.1	10	8.5-10	S2	19	6-10-14	0-3": CLAYEY F. SAND, MODERATE YELLOWISH BROWN (10 YR 5/4), STIFF, MOIST; 3-19": SANDY CLAY, DARK GRAY (N3), SAND IS F. TO MED.,STIFF, MOIST		

BOREHOLE TERMINATED AT 10 FEET

NOTE: STRONG ODOR DETECTED DURING DRILLING BUT NO MONITORING DETECTIONS

WELL SUMMARY

GROUT: 0 TO 3'1"
BENTONITE: 3'1" TO 4'6"
SAND: 4'6" TO 9'
SCREEN: 5'6" TO 9'

PROJECT NUMBER:ATL22398.F0 | BORING NO.: MW11B | SHEET: 1 of 3

CH2M HILL

SOIL BORING LOG

PROJECT: DUPONT KENTEC
LOCATION: LENOIR CO., NC
ELEVATION: ~30 FT MSL
DRILLING CONTRACTOR: HARDIN-HUBER INC.
DRILLING METHOD AND EQUIPMENT: 12" AND 8" MUD ROTARY W/A FAILING F-7
WATER LEVEL AND DATE: 11.9' on 2/21/91 START: 1/21/91 FINISH: 1/29/91 LOGGER: A. BRYDA

DEPTH BELOW SURFACE	DEPTH INTERVAL	TYPE AND NUMBER	R E C	STD. PEN. TEST 6"-6"-6" (N)	SOIL DESCRIPTION: SOIL NAME, COLOR, MOISTURE CONTENT, RELATIVE DENSITY OR CONSISTENCY, SOIL STRUCTURE, MINERALOGY, USCS GROUP SYMBOL	SY MB OL	COMMENTS: DEPTH OF CASING, DRILLING RATE, DRILLING FLUID LOSS, TEST AND INSTRUMENTATION
					FOR SOIL DESCRIPTION FROM 0-10' SEE BORING LOG MW11A. FOR SOIL DESCRIPTION FROM 15-60' SEE BORING LOG MW11C.		AIR MONITORING (AM): HNU AND EXPLOSIMETER. READINGS ARE BACKGROUND OF SPLIT SPOONS AND THE BREATHING ZONE UNLESS OTHERWISE NOTED.
5							
10							
15	13-15	S1	1	2-4-4-5 (8)	0-6" LEAN CLAY W/ SAND, CL, MODERATE YELLOW BROWN (10R5/4), FIRM TO STIFF, MOIST 6-12" LEAN CLAY W/ SAND, CL, MEDIUM GRAY (N5), FIRM TO STIFF, DRY, SAND IS C.		SET 16' OF 8" STEEL SURFACE CASING (+1 TO 15') THEN PUSHED THE CASING 0.5' DOWN INTO THE LOW PERMEABLE UNIT. NOTE: ON 1/24 A HYDROSTATIC PRESSURE TEST WAS COMPLETED ON THE 8" CASING.
20							

CH2M HILL

PROJECT NUMBER: ATL22398.F0 | BORING NO.: MW11B | SHEET: 2 of 3

SOIL BORING LOG

PROJECT: DUPONT KENTEC | LOCATION: LENOIR CO., NC

ELEVATION: -30 FT MSL | DRILLING CONTRACTOR: HARDIN-HUBER INC.

DRILLING METHOD AND EQUIPMENT: 12" AND 8" MUD ROTARY W/A FAILING F-7

WATER LEVEL AND DATE: 11.9' on 2/21/91 START: 1/21/91 FINISH: 1/29/91 LOGGER: A. BRYDA

DEPTH BELOW SURFACE	DEPTH INTERVAL	TYPE AND NUMBER	R E C	STD. PEN. TEST 6"-6"-6" (N)	SOIL DESCRIPTION: SOIL NAME, COLOR, MOISTURE CONTENT, RELATIVE DENSITY OR CONSISTENCY, SOIL STRUCTURE, MINERALOGY, USCS GROUP SYMBOL	SY MBOL	COMMENTS: DEPTH OF CASING, DRILLING RATE, DRILLING FLUID LOSS, TEST AND INSTRUMENTATION
25							
30							
35							
40							

PROJECT NUMBER:ATL22398.F0 | BORING NO.: MW11B | SHEET: 3 of 3

CH2M HILL

SOIL BORING LOG

PROJECT: DUPONT KENTEC | LOCATION: LENOIR CO., NC

ELEVATION: ~30 FT MSL | DRILLING CONTRACTOR: HARDIN-HUBER INC.

DRILLING METHOD AND EQUIPMENT: 12" AND 8" MUD ROTARY W/A FAILING F-7

WATER LEVEL AND DATE: 11.9' on 2/21/91 START: 1/21/91 FINISH: 1/29/91 LOGGER: A. BRYDA

DEPTH BELOW SURFACE	DEPTH INTERVAL	TYPE AND NUMBER	R E C	STD. PEN. TEST 6"-6"-6" (N)	SOIL DESCRIPTION: SOIL NAME, COLOR, MOISTURE CONTENT, RELATIVE DENSITY OR CONSISTENCY, SOIL STRUCTURE, MINERALOGY, USCS GROUP SYMBOL	SY MB OL L	COMMENTS: DEPTH OF CASING, DRILLING RATE, DRILLING FLUID LOSS, TEST AND INSTRUMENTATION
45							
50							
55							WELL CONSTRUCTION INFO 60' TOTAL DEPTH 0-15.5' 8" SURFACE CASING 48.5-58.5' 20 SLOT 4" SCH 40 PVC SCREEN 46-58' #1 MORIE SAND PACK (6-100 LBS BAGS) 34-46' BENTONITE SLURRY 0-34' CEMENT GROUT
60							

SBLSYM 06/14/88

PROJECT NUMBER:ATL22398.F0 | BORING NO.: MW11C | SHEET: 1 of 6

CH2M HILL

SOIL BORING LOG

PROJECT: DUPONT KENTEC | LOCATION: LENOIR CO., NC

ELEVATION: ~30 FT MSL | DRILLING CONTRACTOR: HARDIN-HUBER INC.

DRILLING METHOD AND EQUIPMENT: 12" AND 8" MUD ROTARY W/A FAILING F-7

WATER LEVEL AND DATE: 12.1' on 2/21/91 START: 1/22/91 FINISH: 1/29/91 LOGGER: A. BRYDA

DEPTH BELOW SURFACE	DEPTH INTERVAL	TYPE AND NUMBER	R E C	STD. PEN. TEST 6"-6"-6" (N)	SOIL DESCRIPTION: SOIL NAME, COLOR, MOISTURE CONTENT, RELATIVE DENSITY OR CONSISTENCY, SOIL STRUCTURE, MINERALOGY, USCS GROUP SYMBOL	SY MBOL	COMMENTS: DEPTH OF CASING, DRILLING RATE, DRILLING FLUID LOSS, TEST AND INSTRUMENTATION
					FOR SOIL DESCRIPTION FROM 0-15' SEE BORING LOG MW11A AND MW11B.		AIR MONITORING (AM): HNU AND EXPLOSIMETER. READINGS ARE BACKGROUND OF THE SPLIT SPOON AND THE BREATHING ZONE UNLESS OTHERWISE NOTED.
15							SET 15' OF 8" STEEL CASING FROM 0-15' (2' INTO THE SILT LAYER). NOTE: ON 1/24 A HYDROSTATIC PRESSURE TEST WAS CONDUCTED ON THE 8" CASING.
	18-20	SS1	0.7	22-100/4	SILTY SAND, SM, MEDIUM GRAY (N5), V. DENSE, MOIST, SAND IS M-C.		CIRCULATION LOSS AT 16'. CUTTINGS WERE C. SAND AND FINE GRAVEL.
20							

PROJECT NUMBER: ATL22398.F0 | BORING NO.: MW11C | SHEET: 2 of 6

CH2M HILL

SOIL BORING LOG

PROJECT: DUPONT KENTEC | LOCATION: LENOIR CO., NC

ELEVATION: ~30 FT MSL | DRILLING CONTRACTOR: HARDIN-HUBER INC.

DRILLING METHOD AND EQUIPMENT: 12" AND 8" MUD ROTARY W/A FAILING F-7

WATER LEVEL AND DATE: 12.1' on 2/21/91 START: 1/22/91 FINISH: 1/29/91 LOGGER: A. BRYDA

DEPTH BELOW SURFACE	DEPTH INTERVAL	TYPE AND NUMBER	R E C	STD. PEN. TEST 6"-6"-6" (N)	SOIL DESCRIPTION: SOIL NAME, COLOR, MOISTURE CONTENT, RELATIVE DENSITY OR CONSISTENCY, SOIL STRUCTURE, MINERALOGY, USCS GROUP SYMBOL	SY MB OL	COMMENTS: DEPTH OF CASING, DRILLING RATE, DRILLING FLUID LOSS, TEST AND INSTRUMENTATION
23-25	S2	2.0	14-10-18-23 (28)	SILT W/ SAND, ML, MEDIUM GRAY (N5), V. STIFF, DRY, SAND IS F. AND GLAUCONITIC		
28-30	SH-1	1.0	-			COULD ONLY PUSH THE SHELBY TUBE 1.0'
33-35	S3	2.0	8-14-22-20 (36)	SAME AS S2		
38-40	S4	2.0	16-18-23-23 (41)	SIMILAR TO S2. DRY W/ INTERLAYERED F. SAND, CLAY, AND SILT SEAMS. THESE SEAMS ARE NO MORE THAN 2" THICK		

PROJECT NUMBER:ATL22398.F0 | BORING NO.: MW11C | SHEET: 3 of 6

CH2M HILL

SOIL BORING LOG

PROJECT: DUPONT KENTEC | LOCATION: LENOIR CO., NC

ELEVATION: ~30 FT MSL | DRILLING CONTRACTOR: HARDIN-HUBER INC.

DRILLING METHOD AND EQUIPMENT: 12" AND 8" MUD ROTARY W/A FAILING F-7

WATER LEVEL AND DATE: 12.2' on 2/21/91 START: 1/22/91 FINISH: 1/29/91 LOGGER: A. BRYDA

DEPTH BELOW SURFACE	DEPTH INTERVAL	TYPE AND NUMBER	REC	STD. PEN. TEST 6"-6"-6" (N)	SOIL DESCRIPTION: SOIL NAME, COLOR, MOISTURE CONTENT, RELATIVE DENSITY OR CONSISTENCY, SOIL STRUCTURE, MINERALOGY, USCS GROUP SYMBOL	SY MB OL	COMMENTS: DEPTH OF CASING, DRILLING RATE, DRILLING FLUID LOSS, TEST AND INSTRUMENTATION
45	43-45	S5	2.0	10-17- -23-34 (40)	SIMILAR TO ABOVE W/ A 10" FINE SANDY CLAY SEAM ABOVE 3" OF M. GLAUCONITIC SAND		
50	48-50	S6	1.2	4-5-8-11 (13)	0-5" SAME AS ABOVE 5-14" SILTY SAND, SM, DARK GREENISH GRAY (5GY4/1), MEDIUM, WET, SAND IS M-C., GLAUCONITIC, MICACEOUS, AND SOME SHELLS		
55	53-55	S7	1.1	50-100/3	SAME AS S6 5-14"		
60	58-60	S8	1.0	50-100/3	SAME AS ABOVE, V. GLAUCONITIC		

PROJECT NUMBER:ATL22398.F0 | BORING NO.: MW11C | SHEET: 4 of 6

CH2M HILL

SOIL BORING LOG

PROJECT: DUPONT KENTEC | LOCATION: LENOIR CO., NC

ELEVATION: ~30 FT MSL | DRILLING CONTRACTOR: HARDIN-HUBER INC.

DRILLING METHOD AND EQUIPMENT: 12" AND 8" MUD ROTARY W/A FAILING F-7

WATER LEVEL AND DATE: 12.1' on 2/21/91 START: 1/22/91 FINISH: 1/29/91 LOGGER: A. BRYDA

DEPTH BELOW SURFACE	DEPTH INTERVAL	TYPE AND NUMBER	R E C	STD. PEN. TEST 6"-6"-6" (N)	SOIL DESCRIPTION: SOIL NAME, COLOR, MOISTURE CONTENT, RELATIVE DENSITY OR CONSISTENCY, SOIL STRUCTURE, MINERALOGY, USCS GROUP SYMBOL	S Y M B O L	COMMENTS: DEPTH OF CASING, DRILLING RATE, DRILLING FLUID LOSS, TEST AND INSTRUMENTATION
65	63-65	S9	1.2	34-50-80-100/3 (130)	SIMILAR TO ABOVE S6 5-14", LESS SILT		
70	68-70	S10	0.4	23-56-100/3"	SAME		
75	73-75	S11	0.5	28-70-50/2"	SAME		STOPPED AT 75' ON 1/25/91 STARTED AT 75' ON 1/26/91
80	78-80	S12	2.0	32-66-50/3"	0-14" POORLY GRADED SAND, SP, OLIVE GRAY (5Y3/2), WET, SAND IS F-M., GLAUCONITIC W/ TRACE SHELLS 14-24" SAME AS S6 5-14", SILTY SAND, SM, OLIVE GRAY (5Y3/2), WET, GLAUCONITIC SAND W/ TRACE SHELLS		

PROJECT NUMBER:ATL22398.F0 | BORING NO.: MW11C | SHEET: 5 of 6

CH2M HILL

SOIL BORING LOG

PROJECT: DUPONT KENTEC LOCATION: LENOIR CO., NC

ELEVATION: ~30 FT MSL DRILLING CONTRACTOR: HARDIN-HUBER INC.

DRILLING METHOD AND EQUIPMENT: 12" AND 8" MUD ROTARY W/A FAILING F-7

WATER LEVEL AND DATE: 12.2' on 2/21/91 START: 1/22/91 FINISH: 1/29/91 LOGGER: A. BRYDA

DEPTH BELOW SURFACE	DEPTH INTERVAL	TYPE AND NUMBER	R E C	STD. PEN. TEST 6"-6"-6" (N)	SOIL DESCRIPTION: SOIL NAME, COLOR, MOISTURE CONTENT, RELATIVE DENSITY OR CONSISTENCY, SOIL STRUCTURE, MINERALOGY, USCS GROUP SYMBOL	SY MB OL	COMMENTS: DEPTH OF CASING, DRILLING RATE, DRILLING FLUID LOSS, TEST AND INSTRUMENTATION
85	83-85	S13	1.8	56-100/6	0-8" SILT W/ SAND, ML, OLIVE GRAY (5Y3/2), SL. MOIST, SAND IS F. AND GLAUCONITIC 8-22" SILT, ML, OLIVE GRAY (5Y3/2), SL. MOIST, GLAUCONITIC AND SOME SHELLS		
90	88-90	S14	1.2	30-65- -50/2"	SILTY SAND, SM, OLIVE GRAY (5Y3/2), WET, GLAUCONITIC W/ SHELLS SAND IS F-C.		
95	93-95	S15	0.5	100/3"	POORLY GRADED GRAVEL W/ SAND AND SILT, GP-GM, OLIVE GRAY (5Y3/2), WET, SAND IS C-VC., GRAVEL IS VF., MICACEOUS, GLAUCONITIC, AND SHELLY, SAND AND GRAVEL ARE ROUNDED TO SUBANGULAR.		ROUGH DRILLING ACTION, SOME LOSS OF CIRCULATION.
100							

PROJECT NUMBER:ATL22398.F0 | BORING NO.: MW11C | SHEET: 6 of 6

CH2M HILL

SOIL BORING LOG

PROJECT: DUPONT KENTEC | LOCATION: LENOIR CO., NC

ELEVATION: ~30 FT MSL | DRILLING CONTRACTOR: HARDIN-HUBER INC.

DRILLING METHOD AND EQUIPMENT: 12" AND 8" MUD ROTARY W/A FAILING F-7

WATER LEVEL AND DATE: 12.1' on 2/21/91 START: 1/22/91 FINISH: 1/29/91 LOGGER: A. BRYDA

DEPTH BELOW SURFACE	DEPTH INTERVAL	TYPE AND NUMBER	R E C	STD. PEN. TEST 6"-6"-6" (N)	SOIL DESCRIPTION: SOIL NAME, COLOR, MOISTURE CONTENT, RELATIVE DENSITY OR CONSISTENCY, SOIL STRUCTURE, MINERALOGY, USCS GROUP SYMBOL	SY MB OL	COMMENTS: DEPTH OF CASING, DRILLING RATE, DRILLING FLUID LOSS, TEST AND INSTRUMENTATION
	100-102	S16	0.8	20-100/4	SAME AS S15 SL. MORE SILT		WELL CONSTRUCTION INFO
							102' TOTAL DEPTH
							0-15' 8" SURFACE CASING
							87-97' 20 SLOT 4" SCH 40
							PVC SCREEN
							84-97' #1 MORIE SAND PACK
							(5±100 LBS BAGS)
105							77-84' BENTONITE SLURRY
							0-77' CEMENT GROUT

SBLSYM 06/14/88

PROJECT: KENTEC FACILITY ; GRIFTON, NORTH CAROLINA
DRILLER: WESTINGHOUSE ENVIRONMENTAL LOGGER: STEVEN BROWN
DRILLING METHOD/EQUIPMENT: CME-55 WITH 6 1/4" HSA
GROUND ELEVATION (FT MSL): 27.5 START DATE: 10/5/89 FINISH DATE: 10/5/89

BORING : MW-12
PAGE 1 OF 1
CH2M HILL
PROJECT #:SAT 22398.C0

ELEVATION (FT MSL)	DEPTH (FEET)	SAMPLE COLLECTION DATA: INTERVAL (FEET)	SAMPLE NUMBER	RECOVERY (IN)	STANDARD PENETRATION TEST 6"-6"-6"-6" (N)	WRITTEN LOG	SYMBOLIC LOG	WELL CONSTUCTION 2 Inch PVC
22.5	5	4-5.5	S1	18	13-9-10	0-6": SILTY CLAY, PALE YELLOWISH BROWN (10 YR 6/2), STIFF, MOIST; 6-18": F. TO MED. CLEAN BEACH SAND, GRAYISH ORANGE (10 YR 7/4), WET, LOOSE		GROUT / BENTONITE / SAND
17.5	10	9-10.5	S2	22	10-19-21	0-2": CLAYEY F. TO MED. SAND, PALE YELLOWISH BROWN (10 YR 6/2), STIFF, MOIST; 2-22": SANDY CLAY, DARK GRAY (N3), SAND IS F. TO MED., STIFF, MOIST		

BORING TERMINATED AT 11 FEET

WELL SUMMARY

GROUT: 0 TO 2'10"
BENTONITE: 2'10" TO 5'
SAND: 5' TO 9'6"
SCREEN: 6'3" TO 9'6"

PROJECT: KENTEC FACILITY ; GRIFTON, NORTH CAROLINA
DRILLER: WESTINGHOUSE ENVIRONMENTAL LOGGER: STEVEN BROWN
DRILLING METHOD/EQUIPMENT: CME-55 WITH 6 1/4" HSA
GROUND ELEVATION (FT MSL): 27.1 START DATE: 10/6/89 FINISH DATE: 10/6/89

BORING : MW-13
PAGE 1 OF 1
CH2M HILL
PROJECT #:SAT 22398.C0

ELEVATION (FT MSL)	DEPTH (FEET)	SAMPLE COLLECTION DATA: INTERVAL (FEET)	SAMPLE NUMBER	RECOVERY (IN)	STANDARD PENETRATION TEST 6"-6"-6" (N)	WRITTEN LOG	SYMBOLIC LOG	WELL CONSTUCTION: 2 INCH PVC FLUSH MOUNT
22.1	5	3.5-5	S1	6	11-9-7	0-6": SILTY F. TO VC. SAND WITH VF. TO F. PEBBLES, PALE YELLOWISH BROWN (10 YR 6/2) TO LIGHT BROWN (10 YR 5/6), WET, LOOSE WHERE COARSE, STIFF WHERE SILTY		GROUT / BENTONITE / SAND
		8.5-10	S2	20	30-32-45	0-20": VERY SANDY CLAY, DARK GRAY (N3), MOIST, STIFF		
17.1	10					BOREHOLE TERMINATED AT 9 FEET		

WELL SUMMARY

GROUT: 0 TO 3'
BENTONITE: 3' TO 4'6"
SAND: 4'6" TO 8'10"
SCREEN: 5'8" TO 8'10"

PROJECT: KENTEC FACILITY ; GRIFTON, NORTH CAROLINA
DRILLER: WESTINGHOUSE ENVIRONMENTAL LOGGER: STEVEN BROWN
DRILLING METHOD/EQUIPMENT: CME-55 WITH 6 1/4" HSA
GROUND ELEVATION (FT MSL): 25.4 START DATE: 1/24/90 FINISH DATE: 1/24/90

BORING : MW-14A
PAGE 1 OF 1
CH2M HILL
PROJECT #:SAT 22398.C0

ELEVATION (FT MSL)	DEPTH (FEET)	SAMPLE COLLECTION DATA: INTERVAL (FEET)	SAMPLE NUMBER	RECOVERY (IN)	STANDARD PENETRATION TEST 6"-6"-6"-6" (N)	WRITTEN LOG	SYMBOLIC LOG	WELL CONSTUCTION 2 INCH PVC
20.4	5					NOTE: MW-14A LITHOLOGIES GIVEN IN MW-14B LOG. MW-14B IS 6 FEET AWAY SO MW-14A WAS NOT LOGGED		GROUT / BENTONITE / SAND
15.4	10							

WELL SUMMARY

GROUT: 0 TO 2'1"
BENTONITE: 2'1" TO 2'9"
SAND: 2'9" TO 8'1"
SCREEN: 3'6" TO 8'0"
TOTAL BOREHOLE DEPTH: 8'1"

PROJECT: KENTEC FACILITY ; GRIFTON, NORTH CAROLINA
DRILLER: WESTINGHOUSE ENVIRONMENTAL LOGGER: STEVEN BROWN
DRILLING METHOD/EQUIPMENT: CME-55 WITH 6 1/4" HSA
GROUND ELEVATION (FT MSL): 25.3 START DATE: 1/24/90 FINISH DATE: 1/26/90

BORING : MW-14B
PAGE 1 OF 2
CH2M HILL
PROJECT #:SAT 22398.C0

ELEVATION (FT MSL)	DEPTH (FEET)	SAMPLE COLLECTION DATA: INTERVAL (FEET)	SAMPLE NUMBER	RECOVERY (IN)	STANDARD PENETRATION TEST 6"-6"-6"-6" (N)	WRITTEN LOG	SYMBOLIC LOG	WELL CONSTUCTION
								2 INCH PVC
		3.5-5	S1	22	3-2-3	0-2": FINE TO COARSE SAND, MODERATE YELLOWISH BROWN (10 YR 5/4), LOOSE, MOIST; 2-4": SANDY SILT, MODERATE YELLOWISH BROWN (10 YR 5/4), STIFF, MOIST; 4-22": SANDY SILT WITH SOME CLAY, DARK GREY (N3), STIFF, MOIS T		
20.3	5							
		8.5-10	S2	21	4-5-11	0-10": SAME AS S1, 4-22" INTERVAL, SAND IS VERY FINE TO FINE; 10-21": CLAYEY SILT WITH SOME VERY FINE SAND, DARK GREY (N3), STIFF, MOIST		
15.3	10					NOTE: 6-INCH CASING TO 9 FT BLS		
		13.5-15	S3	18	11-10-17	0-10": SAME AS S2, 0-10" INTERVAL; 10-18": SAME AS S2, 10-21" INTERVAL		GROUT
10.3	15							
		18.5-20	S4	20	11-14-17	0-20": SAME AS S2, 10-21" INTERVAL		
5.3	20							
		23.5-25	S5	22	19-24-50(5")	0-22": SAME AS S2, 0-10" INTERVAL BUT SOME FINE (1-2 MM) STRINGERS OF SAND AND CLAY EVIDENT, SAMPLE IS GLAUCONITIC		
0.3	25							CAVE-IN
		28.5-30	S6	13	18-32-50(5 1/2")	0-13": SAME AS S5		
-4.7	30							BENTONITE
		33.5-35	S7	21	13-19-27	0-21": SAME AS S5		
-9.7	35							
		38.5-40	S8	18	16-24-34	0-10": SILTY FINE TO COARSE SAND WITH SHELL FRAGMENTS, DARK GREY (N3), GLAUCONITIC, STIFF, MOIST; 10-14": SILTY FINE TO VERY COARSE SAND WITH SOME 2-4 MM PEBBLES (5%), FIRM, MOIST; 14-18": LIKE 0-10" INTERVAL BUT MODERATELY LOOSE		
-14.7	40							SAND
		43.5-45	S9	12	50(6") - 50(3")	0-8": MEDIUM TO VERY COARSE SAND WITH SOME SMALL LIMESTONE AND SHELL FRAGMENTS AND VERY FINE PEBBLES, DARK GREY (N3), GLAUCONITIC, LOOSE, WET; 8-12": MEDIUM TO VERY COARSE CLAYEY SAND, DARK GREY (N3), CLAY IS GREENISH GREY, GLAUCONITIC, SOFT TO FIRM		
-19.7	45							
		48.5-50	S10	0	50 (1")	NO RECOVERY. DRILLER REPORTS THAT DRILLING ACTION AND CUTTINGS ARE SIMILAR TO WHAT WAS OBSERVED DURING DRILLING OF S9 INTERVAL		

PROJECT: KENTEC FACILITY ; GRIFTON, NORTH CAROLINA
DRILLER: WESTINGHOUSE ENVIRONMENTAL LOGGER: STEVEN BROWN
DRILLING METHOD/EQUIPMENT: CME-55 WITH 6 1/4" HSA
GROUND ELEVATION (FT MSL): 25.3 START DATE: 1/24/90 FINISH DATE: 1/26/90

BORING : MW-14B
PAGE 2 OF 2
CH2M HILL
PROJECT #:SAT 22398.C0

ELEVATION (FT MSL)	DEPTH (FEET)	SAMPLE COLLECTION DATA: INTERVAL (FEET)	SAMPLE NUMBER	RECOVERY (IN)	STANDARD PENETRATION TEST 6"-6"-6"-6" (N)	WRITTEN LOG	SYMBOLIC LOG	WELL CONSTUCTION 2 INCH PVC
		52-53	S11	11	29-50 (4")	0-11": SILTY FINE TO VERY COARSE SAND,WITH SHELL AND LIMESTONE FRAGMENTS AND VERY FINE PEBBLES OF QUARTZ AND INDURATED MUDSTONE, DARK GREY (N3), SOFT TO LOOSE, WET		SAND
								CAVE-IN
-29.7	55							

WELL SUMMARY

GROUT: 0 TO 25'
CAVE-IN: 25' TO 31'
BENTONITE: 31' TO 34'10"
SAND: 34'10" TO 50'6"
SCREEN: 40'6" TO 50'6"
CAVE-IN: 50'6" TO 52'
TOTAL BOREHOLE DEPTH: 52'

PROJECT: KENTEC FACILITY ; GRIFTON, NORTH CAROLINA
DRILLER: WESTINGHOUSE ENVIRONMENTAL LOGGER: STEVEN BROWN
DRILLING METHOD/EQUIPMENT: CME-55 WITH 6 1/4" HSA
GROUND ELEVATION (FT MSL): 26.2 START DATE: 1/24/90 FINISH DATE: 1/25/90

BORING : MW-15
PAGE 1 OF 1
CH2M HILL
PROJECT #:SAT 22398.C0

ELEVATION (FT MSL)	DEPTH (FEET)	SAMPLE COLLECTION DATA: INTERVAL (FEET)	SAMPLE NUMBER	RECOVERY (IN)	STANDARD PENETRATION TEST 6"-6"-6" (N)	WRITTEN LOG	SYMBOLIC LOG	WELL CONSTUCTION: 2 INCH PVC
		3.5-5	S1	21	12-13-10	0-5": FINE SILTY SAND, DARK YELLOWISH BROWN (10 YR 4/2), FIRM, MOIST; 5-13": SILTY VERY FINE TO FINE SAND, STIFF, MOIST; 13-21": COARSE TO VERY COARSE BEACH SAND, CLEAN, LOOSE, WET, CONTAINS SOME SHELL FRAGMENTS		GROUT
21.2	5							CAVE-IN
								BENTONITE
		8.5-10	S2	12	6-8-12	0-12": CLAYEY SILT WITH SOME SAND, DARK GREY (N3), SAND IS VERY FINE, STIFF, MOIST		SAND
16.2	10							

WELL SUMMARY

GROUT: 0 TO 2'6"
CAVE-IN: 2'6" TO 3'
BENTONITE: 3'0" TO 4'0"
SAND: 4'0" TO 8'6"
SCREEN: 4'10" TO 8'6"
TOTAL BOREHOLE DEPTH: 8'6"

PROJECT: KENTEC FACILITY ; GRIFTON, NORTH CAROLINA
DRILLER: WESTINGHOUSE ENVIRONMENTAL LOGGER: STEVEN BROWN
DRILLING METHOD/EQUIPMENT: CME-55 WITH 6 1/4" HSA
GROUND ELEVATION (FT MSL): 29.5 START DATE: 1/23/90 FINISH DATE: 1/23/90

BORING : MW-16
PAGE 1 OF 1
CH2M HILL
PROJECT #:SAT 22398.C0

ELEVATION (FT MSL)	DEPTH (FEET)	SAMPLE COLLECTION DATA: INTERVAL (FEET)	SAMPLE NUMBER	RECOVERY (IN)	STANDARD PENETRATION TEST 6"-6"-6"-6" (N)	WRITTEN LOG	SYMBOLIC LOG	WELL CONSTUCTION: 2 INCH PVC FLUSH MOUNT
24.5	5	3.5-5	S1	18	3-3-3	0-18": MEDIUM SAND, DARK YELLOWISH ORANGE (10 YR 6/6), WELL SORTED, LOOSE, WET		GROUT / BENTONITE
19.5	10	8-9.5	S2	17	3-2-2	0-7": SAME AS S1; 7-10": MEDIUM TO VERY COARSE SAND, LIGHT BROWN (5 YR 5/6), WITH 3-4 MM PEBBLES AT BASE, LOOSE, WET; 10-17": SANDY SILT, DARK YELLOWISH ORANGE (10 YR 6/6), SAND IS FINE TO MEDIUM, FIRM, MOIST		SAND
14.5	15	13-14.5	S3	9	7-13-19	0-9": VERY SANDY SILT, DARK GREY (N3), STIFF, MOIST		NATURAL BACKFILL

WELL SUMMARY

GROUT: 0 TO 3'8"
BENTONITE: 3'8' TO 5'0"
SAND: 5'0" T0 10'0"
SCREEN: 6'4" TO 9'10"
NATURAL BACKFILL: 10' TO 12'9"
TOTAL DEPTH: 12'9"

PROJECT NUMBER: ATL22398.F0 | BORING NO.: MW17C | SHEET: 1 of 6

CH2M HILL

SOIL BORING LOG

PROJECT: DUPONT KENTEC | LOCATION: LENOIR CO., NC

ELEVATION: ~30 FT MSL | DRILLING CONTRACTOR: HARDIN-HUBER INC.

DRILLING METHOD AND EQUIPMENT: 12" AND 8" MUD ROTARY W/A FAILING F-7

WATER LEVEL AND DATE: 12.1' on 2/21/91 | START: 1/23/91 | FINISH: 2/5/91 | LOGGER: A. BRYDA

DEPTH BELOW SURFACE	DEPTH INTERVAL	TYPE AND NUMBER	REC	STD. PEN. TEST 6"-6"-6" (N)	SOIL DESCRIPTION: SOIL NAME, COLOR, MOISTURE CONTENT, RELATIVE DENSITY OR CONSISTENCY, SOIL STRUCTURE, MINERALOGY, USCS GROUP SYMBOL	SY MBOL	COMMENTS: DEPTH OF CASING, DRILLING RATE, DRILLING FLUID LOSS, TEST AND INSTRUMENTATION
							AIR MONITORING (AM): HNU AND EXPLOSIMETER. READINGS ARE BACKGROUND OF THE SPLIT SPOON AND THE BREATHING ZONE UNLESS OTHERWISE NOTED.
5							
10							COLOR CHANGE IN THE DRILLING MUD AT 10'
	11-13	S1	1.8	6-12--10-16 (22)	SILT W/ SAND, ML, MEDIUM DARK GRAY (N4), V. STIFF, DRY, SAND IS M-C.		
							SET 13' OF 8" STEEL CASING FROM 0-13' (2 TO 3' INTO THE SILT LAYER).
15	15-17	S2	1.7	9-11--20-20 (31)	WELL GRADED SAND W/ CLAY, SW-SC, GRAYISH OLIVE (10Y4/2), WET, DENSE, SAND IS C. AND ROUNDED.		NOTE: ON 1/24 A HYDROSTATIC PRESSURE TEST WAS CONDUCTED ON THE 8" CASING.
							SAMPLE S2 HNU 2PPM
20							

CH2M HILL

PROJECT NUMBER: ATL22398.F0 | BORING NO.: MW17C | SHEET: 2 of 6

SOIL BORING LOG

PROJECT: DUPONT KENTEC
LOCATION: LENOIR CO., NC
ELEVATION: ~30 FT MSL
DRILLING CONTRACTOR: HARDIN-HUBER INC.
DRILLING METHOD AND EQUIPMENT: 12" AND 8" MUD ROTARY W/A FAILING F-7
WATER LEVEL AND DATE: 12.1' on 2/21/91 START: 1/23/91 FINISH: 2/5/91 LOGGER: A. BRYDA

DEPTH BELOW SURFACE	DEPTH INTERVAL	TYPE AND NUMBER	R E C	STD. PEN. TEST 6"-6"-6" (N)	SOIL DESCRIPTION: SOIL NAME, COLOR, MOISTURE CONTENT, RELATIVE DENSITY OR CONSISTENCY, SOIL STRUCTURE, MINERALOGY, USCS GROUP SYMBOL	SY MBOL	COMMENTS: DEPTH OF CASING, DRILLING RATE, DRILLING FLUID LOSS, TEST AND INSTRUMENTATION
	20-22	S3	1.9	6-12-14-12 (26)	SILT W/ SAND, ML, GRAYISH OLIVE (10Y4/2), V. STIFF, DRY, SAND IS F-M.		SAMPLE S3 HNU IS 3 PPM
25	25-27	S4	2.0	10-15-19-29 (34)	WELL GRADED SAND W/ SILT, SW-SM, GRAYISH OLIVE (10Y4/2), DENSE, MOIST, SAND IS F-M, GLAUCONITIC AND MICACEOUS		SAMPLE S4 HNU IS 2.5 PPM
30	30-32	SH-1	1.5	-			
35	35-37	S5	1.9	12-22-35-40 (57)	0-12" SAME AS S4 12-23" VARVED CLAY AND SAND, DRY, SAND IS FINE AND GLAUCONITIC		SAMPLE S5 HNU IS 1.8 PPM DRILLER CHANGES MUD
40							

CH2M HILL

PROJECT NUMBER: ATL22398.F0 | BORING NO.: MW17C | SHEET: 3 of 6

SOIL BORING LOG

PROJECT: DUPONT KENTEC | LOCATION: LENOIR CO., NC

ELEVATION: ~30 FT MSL | DRILLING CONTRACTOR: HARDIN-HUBER INC.

DRILLING METHOD AND EQUIPMENT: 12" AND 8" MUD ROTARY W/A FAILING F-7

WATER LEVEL AND DATE: 12.1' on 2/21/91 START: 1/23/91 FINISH: 2/5/91 LOGGER: A. BRYDA

DEPTH BELOW SURFACE	DEPTH INTERVAL	TYPE AND NUMBER	R E C	STD. PEN. TEST 6"-6"-6" (N)	SOIL DESCRIPTION: SOIL NAME, COLOR, MOISTURE CONTENT, RELATIVE DENSITY OR CONSISTENCY, SOIL STRUCTURE, MINERALOGY, USCS GROUP SYMBOL	SY MB OL	COMMENTS: DEPTH OF CASING, DRILLING RATE, DRILLING FLUID LOSS, TEST AND INSTRUMENTATION
	40-42	S6	2.0	12-13-18-19 (31)	SILT W/ SAND, ML, OLIVE GRAY (5Y3/2), HARD, DRY, SAND IS F. AND IS IN THIN SEAMS		SAMPLE S6 HNU IS 1.8 PPM
45	45-47	S7	2.0	13-19-35-42 (54)	0-10" SAME AS ABOVE 10-24" POORLY GRADED SAND W/ SILT, SP-SM, OLIVE GRAY (5Y3/2), WET, SAND IS M-C. GLAUCONITIC W/ SHELLS AND SOME F. GRAVEL		
50	50-52	S8	1.9	13-25-42-52 (67)	SAME AS S7 10-24"		HYDRAULIC LINE ON DRILL RIG RUPTURES AFTER OBTAINING S8. STOP DRILLING ON 1/31/91. CONTINUE DRILLING ON 2/4/91 AFTER MOVING THE RIG OFF THE BOREHOLE AND DECONNING EVERYTHING AND CHANGING THE DRILLING MUD.
55	55-57	S9	1.2	16-48-56-70 (104)	POORLY GRADED SAND W/ SILT, SP-SM, GRAYISH OLIVE GRAY (5GY3/2), WET, SAND IS M-C., GLAUCONITIC, SOME SHELLS		SAMPLE S9 HNU IS 2 PPM, NO ODOR PRESENT. NOTE: SOME PAINTERS WERE WORKING ~100' UPWIND OF OUR LOCATION ON 2/4 AND 2/5.
60							

CH2M HILL

PROJECT NUMBER: ATL22398.F0 | BORING NO.: MW17C | SHEET: 4 of 6

SOIL BORING LOG

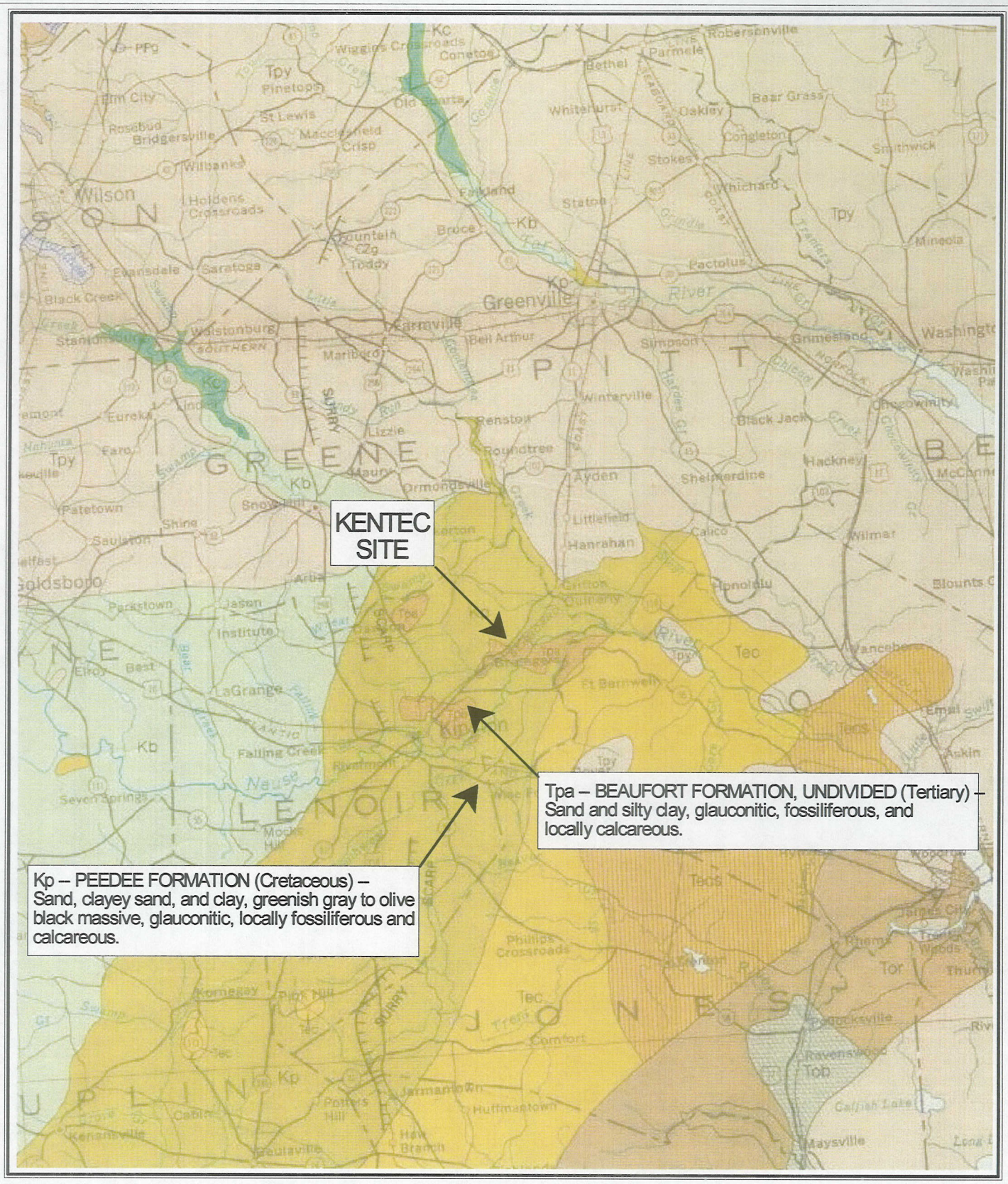
PROJECT: DUPONT KENTEC | LOCATION: LENOIR CO., NC

ELEVATION: ~30 FT MSL | DRILLING CONTRACTOR: HARDIN-HUBER INC.

DRILLING METHOD AND EQUIPMENT: 12" AND 8" MUD ROTARY W/A FAILING F-7

WATER LEVEL AND DATE: 12.1' on 2/21/91 START: 1/23/91 FINISH: 2/5/91 LOGGER: A. BRYDA

DEPTH BELOW SURFACE	DEPTH INTERVAL	TYPE AND NUMBER	R E C	STD. PEN. TEST 6"-6"-6" (N)	SOIL DESCRIPTION: SOIL NAME, COLOR, MOISTURE CONTENT, RELATIVE DENSITY OR CONSISTENCY, SOIL STRUCTURE, MINERALOGY, USCS GROUP SYMBOL	SY MBOL	COMMENTS: DEPTH OF CASING, DRILLING RATE, DRILLING FLUID LOSS, TEST AND INSTRUMENTATION
	60-62	S10	1.0	21-41-58/4" (99)	SAME AS S9		SAMPLE S10 HNU IS 3 PPM
65	65-67	S11	1.3	13-40-62-50/2 (102)	SAME W/ VC. SAND SEAMS FROM 0-4"		SAMPLE S11 HNU IS 3 PPM
70	70-72	S12	1.0	20-37-100/5"	SAME AS ABOVE W/O VC. SAND		SOME CIRCULATION LOSS SAMPLE S12 HNU IS 2 PPM
75	75-77	S13	0.9	20-30-65-50/3 (95)	SAME		SAMPLE S13 HNU IS 1 PPM
80							



N

Reference: Geologic Map of North Carolina, 1985, Coastal Plain

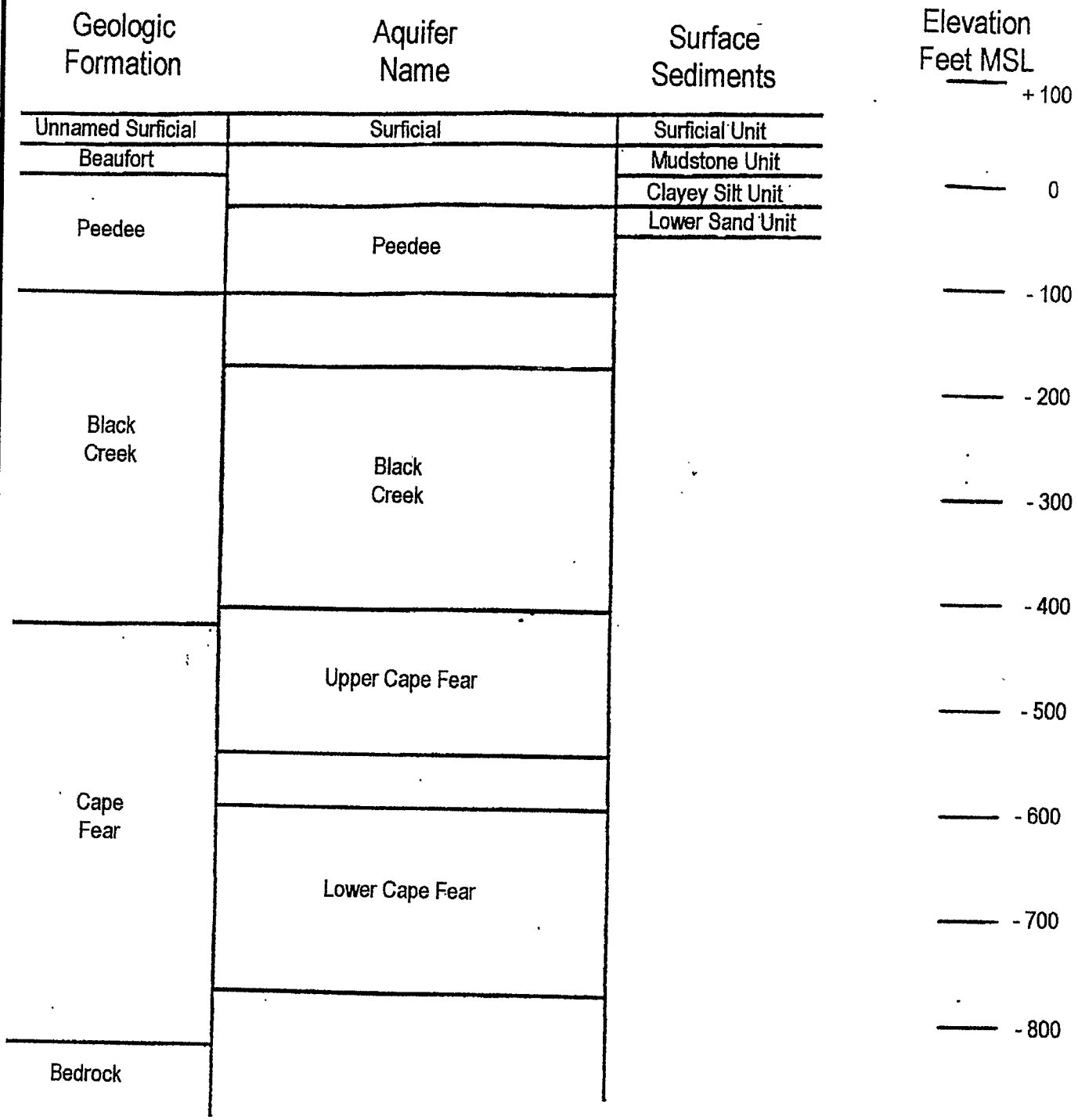
DUPONT

CORPORATE REMEDIATION GROUP
An Alliance between
DuPont and URS Diamond
6324 Fairveiw Road
Charlotte, NC 28210

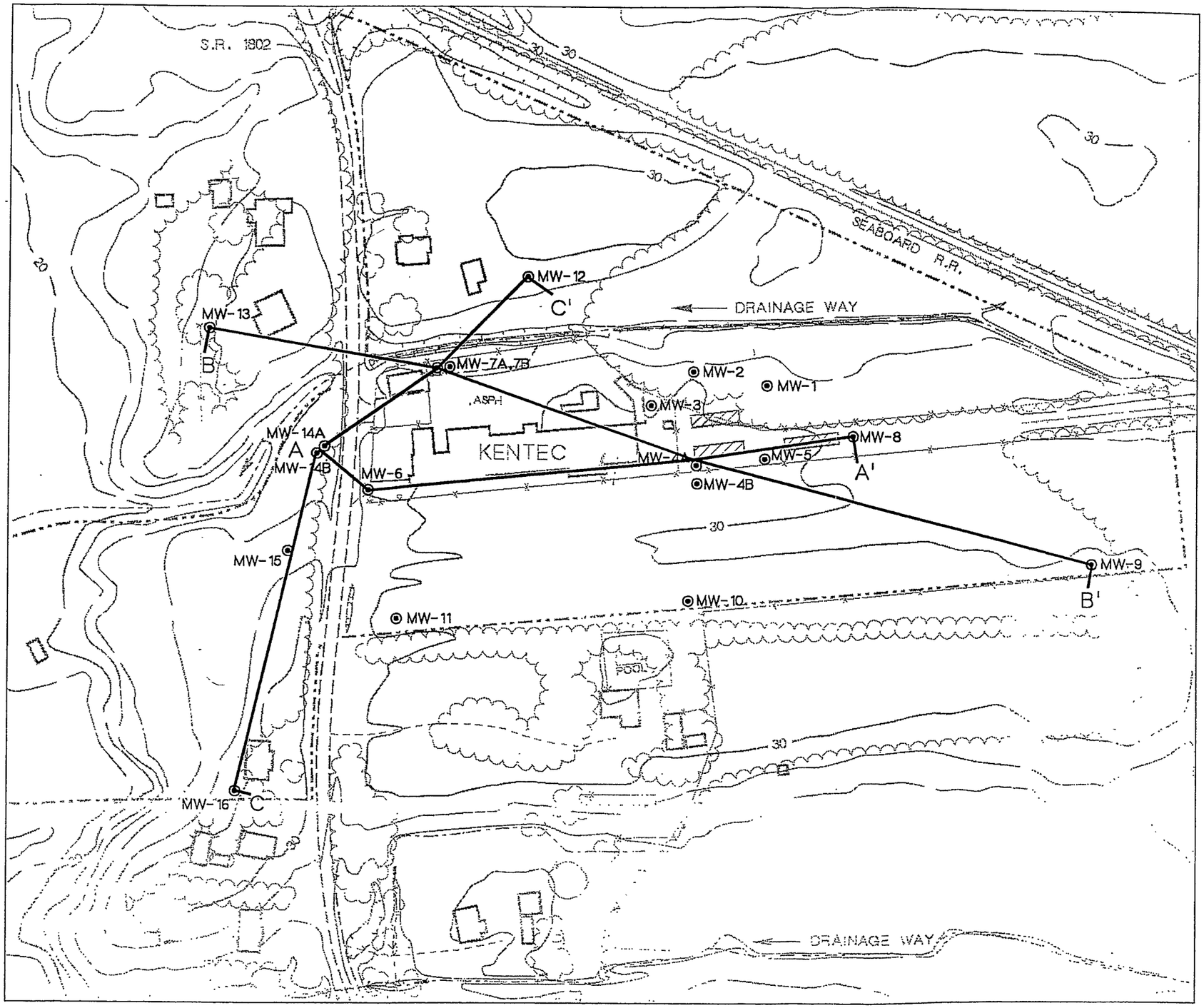
TITLE:

Area Geologic Map
DuPont Kentec Facility

DRAWN:	APPROVED:	PROJECT NO.:
EA	AFA	
CHECKED:	DATE:	
MH	6/18/01	FIGURE NO.:
FILE NAME:	REVISION:	
geomap.apr		



Corporate Remediation Group An Alliance between DuPont and The W-C Diamond Group 140 Cypress Station Drive, Suite 140 Houston, Texas 77090	TITLE: Geologic Formations and Associated Aquifers RFI Phase I Report DuPont Kinston Plant	DWN: / APPD: DEE CHKD: RLL / REV.: DATE: 7/17/00	PROJECT NO.: 4127-52 FIGURE NO.: 15



N

LEGEND

⊙ MONITORING WELLS

0 75 150 225

SCALE: 1"=150'

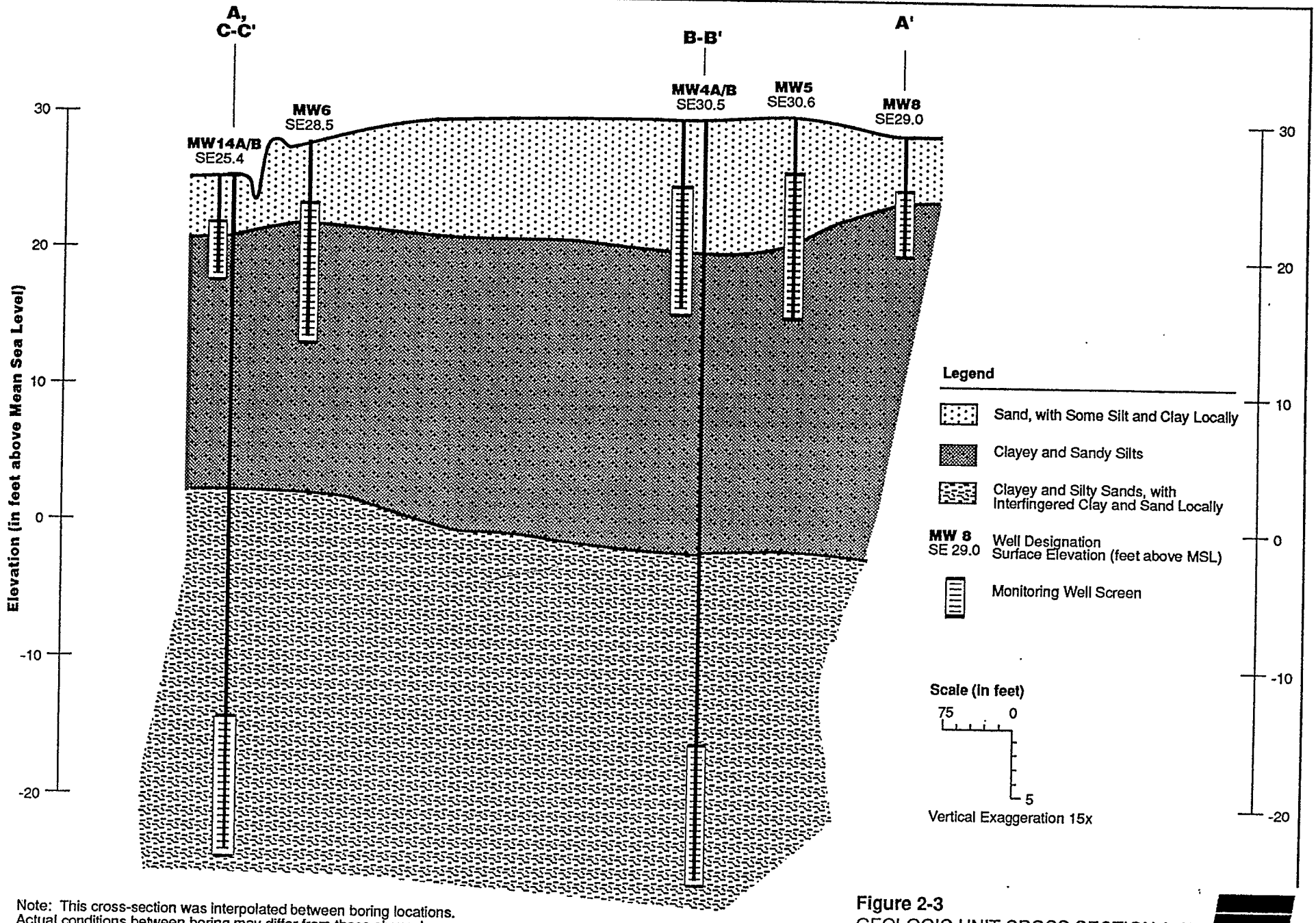
NOTE: BASE MAP COMPILED FROM AERIAL PHOTOGRAPHY FLOWN ON 2/10/89.

Figure 2-2

LOCATION OF GEOLOGIC CROSS SECTIONS
Du Pont Kentec Facility

CH2MHILL

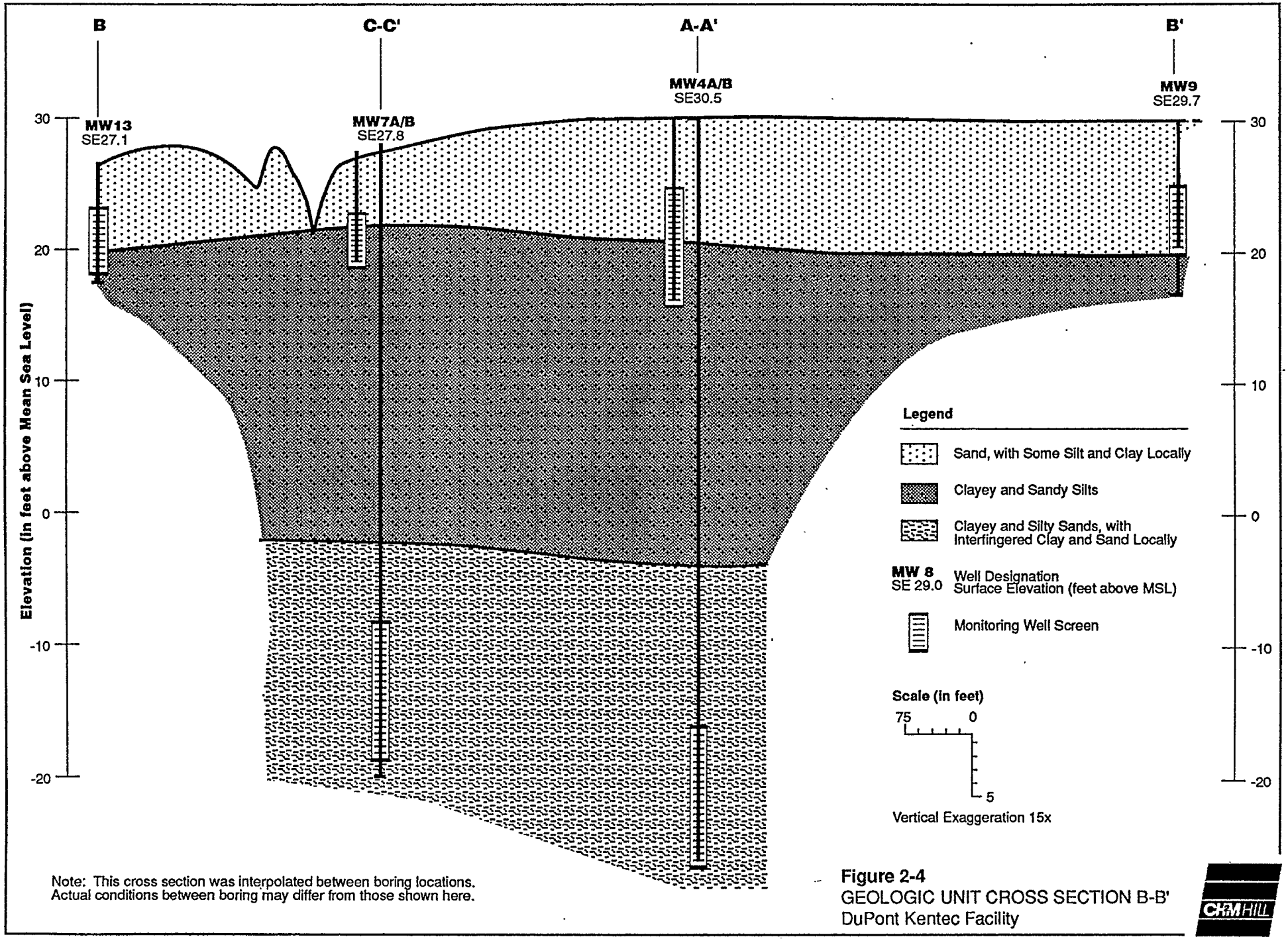
2398fc06.dgn 20-Mar-1991



Note: This cross-section was interpolated between boring locations.
Actual conditions between boring may differ from those shown here.

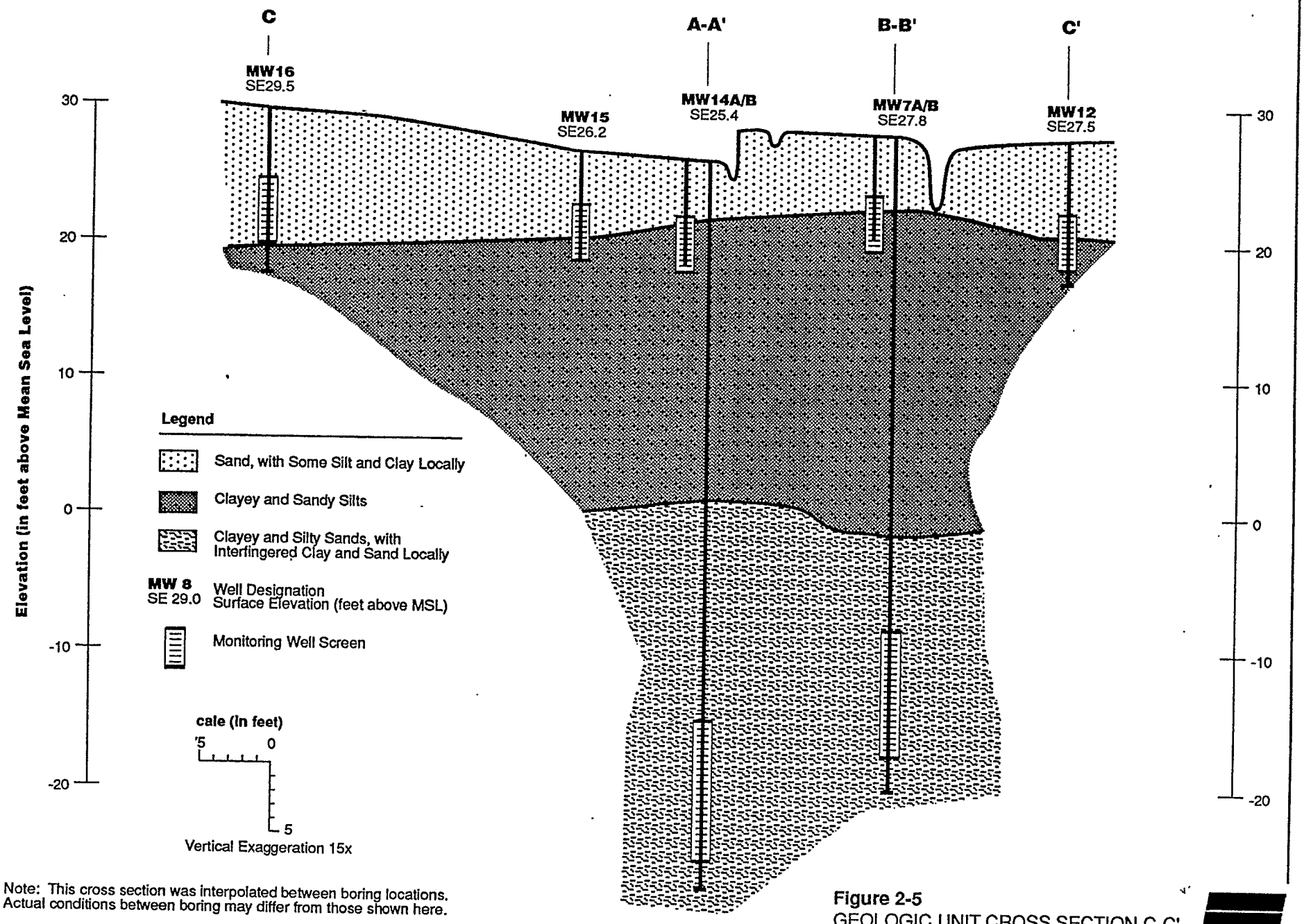
Figure 2-3
GEOLOGIC UNIT CROSS SECTION A-A'
DuPont Kentec Facility

CH2MHILL



Note: This cross section was interpolated between boring locations. Actual conditions between boring may differ from those shown here.

Figure 2-4
GEOLOGIC UNIT CROSS SECTION B-B'
DuPont Kentec Facility



Note: This cross section was interpolated between boring locations. Actual conditions between boring may differ from those shown here.

Figure 2-5
GEOLOGIC UNIT CROSS SECTION C-C'
DuPont Kentec Facility